AN AUTOMATED TECHNIQUE FOR ESTIMATING DAILY PRECIPITATION OVER THE STATE OF VIRGINIA

Prepared for NATIONAL AERONAUTICS AND SPACE ADMINISTRATION WALLOPS FLIGHT CENTER WALLOPS ISLAND, VA 23337

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Prepared by COMPUTER SCIENCES CORPORATION 105 CLARKE AVENUE POCOMOKE CITY, MD 21851



under CONTRACT NAS6-2947 WORK ORDER No. 26

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SECTION 1 - INTRODUCTION

A dependable environmental data base is required by the agriculturalist in his crop management practices and problems. Much of this is provided directly. An important indirect channel is computerized crop management models such as those developed by Virginia Polytechnic Institute and State University (VPI&SU). aimed at optimizing irrigation procedures and controlling plant diseases and pests. These models require reliable estimates of precipitation on a day-to-day basis in near real time. Daily observations of precipitation reported on a network of rain gages provides accurate data for the immediate vicinity of each gage. If the distribution of gages were uniform and sufficiently dense (say several hundred gages over the state of Virginia) and if all measurements were made at the same time of day, and made immediately available to the computer, then interpolation between gages should provide a reliable estimate field for the entire state. In practice, meeting these criteria is both difficult and expensive. Furthermore, convective rain, the predominant type during the growing season, is usually sharply discontinuous, frequently invalidating straightforward interpolative methods.

A number of investigators have developed and tested methods to estimate precipitation using meteorological satellite data. See Barrett (1 & 2), Chan (3), Follansbee and Oliver (4), Follansbee (5), Griffith et al. (6), Martin and Scherer (7), Scofield and Oliver (8), and Woodley and Sax (9). These techniques show varying skill in delineating precipitation patterns in the data-sparse areas between gages. Geostationary satellites, which provided complete cloud photograph coverage of the United States every half hour during daylight hours in the visible spectrum and around-the-clock in the IR, are particularly useful.

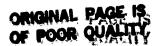
An excellent technique based on geostationary satellite data developed by Scofield and Oliver (8), has been used successfully by the Synoptic Analysis Branch of the National Environmental Satellite Service (NESS) in support of the Quantitative Precipitation Branch (QPB) and the Weather Service Forecast Office (WSFO) of the National Weather Service (NWS) in estimating heavy precipitation and flood situations. Another such technique, developed jointly by the University of Wisconsin and the National Hurricane and Experimental Meteorology Laboratory, Miami, Florida, has been used in support of the GATE project of the Global Atmospheric Research Program. See Martin et al. (10) and Griffith et al. (11) Both methods depend in large part on the following

facts taken from Scofield and Oliver (8) and Woodley et al. (12) regarding rain clouds:

- 1. Bright clouds in the visible imagery produce more rain than darker clouds.
- 2. Bright clouds in the visible imagery and clouds with cold tops in the infrared imagery which are expanding in areal coverage produce more rainfall than those not expanding.
- 3. Decaying clouds produce little or no rainfall.
- 4. Clouds with cold tops in the IR imagery produce more rain than those with warmer tops.
- 5. Clouds with cold tops that are becoming warmer produce little or no rain.
- 6. Merging of cumulonimbus clouds increases the rainfall rate of the merging clouds.
- 7. Most of the significant rainfall occurs in the upwind (at anvil level) portion of a convective system. The highest and coldest clouds form where the thunderstorms are most vigorous and the rain heaviest. These cold clouds get thinner downwind and look warmer in IR imagery as the anvil material blows away from its origin over the updraft.

The Scofield/Oliver technique was tentatively selected as a model for making daily estimates of precipitation over Virginia because of its great success in estimating flood-producing rains over the United States in near real time Scofield and Oliver (13), Scofield (14&15). Experiment with this technique, which was developed primarily for very heavy convective rains during the warmer months of the year, suggested that modifications would be advisable when applying it to light rain situations, to synoptic scale storms, and (especially) to winter storms. Time being of the essence in the operational mode, it was decided to follow the hourly changes and movements of storm clouds in the enhanced infrared (EIR) only, rather than the half-hourly in both the EIR and visible imagery, as called for in the Scofield/Oliver scheme. Scofield tried this approach on the large synoptic storm over the north-eastern United States on October 9, 1976, with encouraging results. This variation of the Scofield/Oliver technique will be referred to hereafter as the S technique.

Hourly radar charts from the National Facsimile Circuit of NWS, and hourly radar reports from Patuxent, Maryland and Bristol, Tennessee were used to locate areas of heavier rain, but (generally speaking) not to estimate amounts.



SECTION 2 - PRELIMINARY STUDIES

Seven storms occurring between May and November 1978 were analyzed by hand. Isohyets of hourly rainfall estimates, based on the S technique slightly modified by radar reports, were drawn on the map of Virginia and its immediate vicinity. From these isohyetal charts, estimates for 25 stations equipped with rain gages were tabulated for each hour from 1200Z (noon Greenwich Mean Time) on one day to 1200Z the following day. The hourly estimates were summed and compared with observed rainfall amounts at the 25 stations for the same time period. The results ranged from excellent to poor. Obviously, to be operationally effective, estimates adjacent to these stations would have to be adjusted to the gage readings. Furthermore, the 25 stations, which report daily on National Facsimile and/or Service C Teletype Circuits, should be supplemented by as many volunteer stations as feasible.

Eventually a simplified and rapid method of estimating rain from satellite imagery was designed as a possible alternative to the more laborious and time-consuming S technique. This quick (Q) technique assigned rain for a given hour in accordance with the cloud top temperature in the EIR imagery at the end of that hour. (Later the cloud top temperature at the beginning of the hour was used.) The digital enhancement (Mb) curve was used: areas shaded medium gray (-32 to -41°C) were assigned 0.05 inch of rain; areas shaded light gray (-41 to -52°C) were assigned 0.10 inch, areas of dark gray (-52 to -58°C) were assigned 0.25 inch; black areas (-58 to -62°C) were designated 0.50 inch; repeat gray level areas (-62 to -80°C) were designated 1.00 inch, and white areas (below -80°C) were assigned 1.50 inches. (See Table 2-1.)

Table 2-1. Cloud Top Temperature vs Precipitation Used in 1978 Storms

Enhanced Shade (Mb curve)	Temperature Range (°C)	Precipitation (inches)
Medium gray	-32 to -41	0.05
Light gray	-41 to -52	0.10
Dark gray	-52 to -58	0.25
Black	-58 to -62	0.50
Repeat gray	-62 to -80	1.00
White	Below -80	1.50

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The Q technique gave larger errors than the S technique in estimating precipitation at the 25 daily reporting stations for the seven 1973 storms. However, it was never intended that either method be used alone as an operational tool, Ideally, any operational satellite technique should be corrected for "ground truth" observed rain at all gages in the network, and modified by interpolation of the gage readings. Or, put another way, an isohyetal field based on the gage readings alone should be modified by reference to the satellite estimate field. Satellite methods have the advantage of covering the entire field, but fail to provide exactly accurate estimates at given points. On the other hand, gage networks provide exact measurements at fixed points, but the interpolations are inexact. This suggests that optimal results are likely to be obtained by a judicious blend of the two. With this in mind, nine methods of estimating 24-hour precipitation over the state were designed and tested on the seven storms of 1978. These nine methods will be referred to as G, S, Q, Sm, Qm, Sa, Qa, Sam and Qam.

Method G used 24-hour precipitation amounts from a network of 63 rain gages to interpolate the estimate field. The interpolation method is described in the next section. This network consisted of 25 stations which report daily on the NWS facsimile and teletype circuits, and 38 stations reporting several months after the fact in NWS Climatological Data Summaries (CDS). Forty-nine stations' reports from the CDS were held in reserve as control data for verification purposes. (See Figure 2.1)

The S and Q methods are the S and Q techniques described above. The Sm method produces an estimate field from the mean of the S value and G value at each point in the field. The Qm method takes the mean between the Q and G values at each point to obtain the Qm field.

Considering the gage reading to be ground truth at the gage location, the error for S at each analysis gage location was computed and an error field derived by interpolation. S values at all points in the state were adjusted by this error field to get the Sa field. This is the Sa method. The same procedure was used to adjust the Q values and obtain the Qa field. This is the Qa method.

The Sam method takes the mean between the Sa and G values at each point to obtain the Sam field. The Qam method obtains the Qam field from the mean of the Qa value and G value at each point. (In actual practice the interpolations were made only for the control station locations, in order to verify each method.)

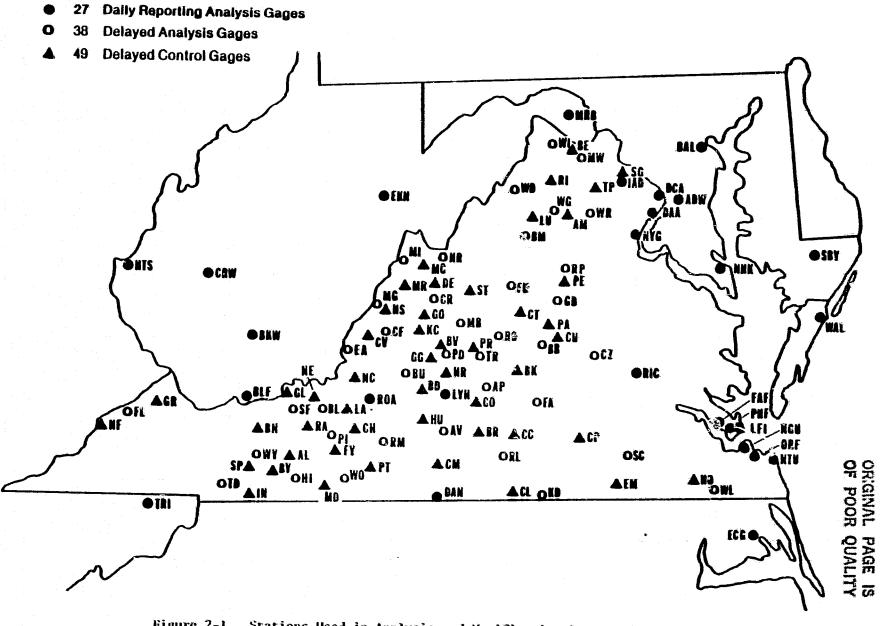


Figure 2-1. Stations Used in Analysis and Verification in 1978 Storms

Each of the nine methods was tested for each of the seven storms in 1978, using the 49 control stations for verification. Table 2-2 gives composite scores for each method for the seven storms taken together, including mean absolute error, mean algebraic error (bias), and the correlation coefficient for each method versus observed precipitation. The Qa method obtained the best scores, but the Qam and Sam, ranking second and third, respectively, were almost as good. The Q method ranked a poor last, and the S method is next to the last, but decidedly superior to Q. The G method is in the middle of the group, but it shows the highest correlation coefficient on three of the storms, and the least absolute error on two storms. Table 2-3 through 2-9 show the performance of each method on each individual storm.

These scores suggest that although either satellite method taken alone will seldom produce the best estimates state-wide, estimates based on the Q method, when adjusted by observed gage readings, may frequently be more accurate than estimates based on interpolations between observed gage measurements alone. The scores also indicate that it is safe to adopt the various Q methods while abandoning the labor-intensive, time-consuming S methods.

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Table 2-2. Composite Scores for each Method for Seven 1978 Storms Combined

Method	Correlati Coefficie		Mean Err (Absolut		Mean Error (Algebraic	
G	0.824	(6)	0.200	(4)	-0.014	(3)
S	0.713	(8)	0.257	(8)	-0.123	(8)
Q	0.481	(9)	0.336	(9)	-0.197	(9)
Sm	0.835	(4)	0,200	(4)	-0.070	(6)
Qm	0.820	(7)	0.235	(7)	-0.109	(7)
Sa	0.827	(5)	0.209	(6)	-0.016	(5)
Qa	0.845	(1)	0.194	(1)	-0.006	(1)
Sam	0.841	(2)	0.196	(3)	-0.014	(3)
Qam	0.841	(2)	0.194	(1)	-0.010	(2)

N=317. Mean Rain at Control Stations: 0.574 inch.

NOTE: Numbers in parentheses indicate rank. *Inches.

Table 2-3. Scores for Storm May 4-5, 1978

Method	Correlation Coefficient	Mean Error (Absolute)*	Mean Error (Algebraic)*
G	0.915	0.188	-0.01
S	0.598	0.441	-0.36
Q	-0.192	0.773	-0.69
Sm	0.875	0.264	-0.19
Qm	0.835	0.420	-0.38
Sa	0.899	0.213	-0.06
Qa	0.904	0.198	0.00
Sam	0.914	0.194	-0.04
Qam	0,913	0.187	-0.01

N=46. Mean rain at control stations: 1.370 inches.

NOTE: Best scores are underlined. *Inches.

Table 2-4. Scores for Storm May 31-June 1, 1978

Method	Correlation Coefficient	Mean Error (Absolute)*	Mean Error (Algebraic)*
G	0.776	0.052	+0.04
S	0.838	0.015	+0.01
Q	0.670	0.015	0.00
Sm	0.907	0.028	+0.03
Qm	0.828	0.026	+0.02
Sa	0.735	0.044	+0.03
Qa	0.814	0.050	+0.04
Sam	0.767	0.048	+6.04
Qam	0.805	0.051	+0.04

N=45. Mean rain at control stations: 0.014 inch.

NOTE: Best scores underlined. *Inches.

Table 2-5. Scores for Storm June 8-9, 1978

Method	Correlation Coefficient	Mean Error (Absolute)*	Mean Error (Algebraic)*
G	0.867	0.130	-0.03
S	0.550	0.259	-0.10
Q	0.142	0.285	0.00
Sm	0.826	0.149	-0.06
Qm	0.754	0.170	-0.01
Sa	0.813	0.171	+0.03
Qa	0.810	0.150	-0.03
Sam	0.862	0.139	0.00
Qam	0.849	0.132	-0.03

N=44. Mean rain at control stations: 0.459 inch.

NOTE: Best scores underlined. *Inches.

Table 2-6. Scores for Storm June 21-22, 1978

Method	Correlation Coefficient	Mean Error (Absolute)*	Mean Error (Algebraic)*
G	0.363	0.301	+0.04
S	0.282	0,314	-0.03
Q	0.435	0.244	-0.06
Sm	0.368	0.278	0.00
Qm	0.439	0.263	-0.01
Sa	0.409	0.320	+0.02
Qa	0.541	0.254	+0.04
Sam	0.406	0.295	+0.03
Qam	0.477	0.276	+0.04

N=46. Mean rain at control stations: 0.369 inch.

NOTE: Best scores underlined. *Inches.

Table 2-7. Scores for Storm July 14-15, 1978

Method	Correlation Coefficient	Mean Error (Absolute)*	Mean Error (Algebraic)*
G	0.576	0.192	+0.05
S	0.425	0.138	-0.02
Q	0.280	0.193	-0.08
Sm	0.595	0.174	+0.01
Qm	0.581	0.165	-0.02
Sa	0,599	0.173	+0.03
Qa	0.544	0.190	+0.08
Sam	0.632	0.176	+0.04
Qam	0.567	0.188	+0.07

N=43. Mean rate at control stations: 0.222 inch.

NOTE: Best scores underlined. *Inches.

Table 2-8. Scores for Storm July 31-August 1, 1978

Method	Correlation Coefficient	Mean Error (Absolute)*	Mean Error (Algebraic)*
G	0.195	0,415	-0.20
S	0.499	0.384	-0.26
Q	0.366	0.403	-0.15
Sm	0.522	0.369	-0.23
Qm	0.462	0,365	-0.17
Sa	0.488	0.380	-0.18
Qa.	0,453	0.384	-0.17
Sam	0.411	0.388	-0.19
Qam	0.357	0.395	-0.19

N=48. Mean rate at control stations: 0.536 inch.

NOTE: Best scores underlined. *Inches.

Table 2-9. Scores for Storm November 16-17, 1978

Method	Correlation Coefficient	Mean Error (Absolute)*	Mean Error (Algebraic)*
G	0.851	0.105	+0.01
S	0.109	0.180	-0.10
Q	-0.440	0.418	-0.40
Sm	0.638	0.118	-0.05
Qm	0.657	0.220	-0.19
Sa	0.574	0.144	+0.02
Qa	0.802	0.123	0.00
Sam	0.755	0.114	+0.02
Qam	0.846	0.110	+0.01

N=45. Mean rate at control stations: 0.554 inch.

NOTE: Best scores underlined. *Inches.

SECTION 3 - DESCRIPTION OF AUTOMATED TECHNIQUE

Photographs of Virginia and vicinity taken by the geostationary satellite located over the equator at 75° west longitude consist of very small picture elements (pixels). Due to foreshortening at the latitude of Virginia, each pixel is a photograph of a rectangular area 9.7 kilometers north-south and 6.2 kilometers east-west. There are 4879 of these cells in the rectangle enclosing the state of Virginia and its immediate vicinity. The information in each pixel is the cell's cloud top temperature to the nearest whole degree Celsius. If digital cloud data could be accessed at need, a linear relationship between cloud top temperature and hourly precipitation might be used. This would be a great refinement of the scale shown in Table 2-1.

NASA was fortunate in arranging for receipt of the digital IR and visible imagery for Virginia on a continuing basis. The dedicate source is the National Meteorological Center (NMC) of NWS located at Camp Springs, Maryland. Hourly digital imagery, both IR and visible, is stored in NMC's data tank. Each picture, if needed, must be acquired by NASA (later by VPI&SU) via autodial within 18 hours of picture-taking time (before it is erased in order to store more recent pictures.)

As a consequence of this data breakthrough, a number of options and strategies under consideration were abandoned. These included time-consuming hand analysis of satellite imagery by a professional meteorologist, transfer of hourly isohyetal analysis to bit-pad equipment using a cursor, and complicated summation of the isohyetal fields to get 24-hour totals for all cells. Since these slower procedures were abandoned, no description is necessary.

The system now in use consists of two computer programs written in FORTRAN. See Appendix A for a complete listing of these programs. The first program computes the satellite estimate (Q) field from the hourly digital IR imagery. The second program computes the final estimate for the entire state area by comparing five preliminary estimates of 24-hour precipitation (Q, G, Qa, Qm and Qam) with control raingage readings and determining which of the five methods gives the best estimate for the day. The final estimate is then produced by incorporating control gage readings into the winning method.

The satellite estimation program consists of the main drive routine RAINDR and five subroutines: PREPRO, RDATA, QUICK, LOOKUP, and RAINSM (see Appendix A).

RAINDR processes each hour of satellite IR imagery as follows: First, in subroutine PREPRO, the raw data (as received from NMC via autodial) is stripped
down to the minimum size which still covers the entire state. Next, each
pixel in the reduced data set is converted from temperature to rainfall amount
in subroutine QUICK (the Q method) using the temperature to rainfall conversion
table generated in subroutine LOOKUP. This new data set is then added to the
total rainfall data set in subroutine RAINSM. After all 24 hours of IR imagery
have been processed the sum in the total rainfall file is the 24-hour satellite
estimate - the Q method estimate for the day.

The final estimation program consists of the main driver routine MAIN and 7 subroutines: GNDTRU, FILSIA, SORT, INTERP, NXTPNT, RANGE, and WEIGHT. The final rainfall estimate is computed by MAIN as follows: The satellite estimate. computed previously in the first program, and the gage readings for each reporting ground station are entered in subroutine FILSTA. Subroutine INTERP then computes the interpolated rainfall and error values for each control station in the system using these values at each analysis station. Subroutines SORT, NXTPNT, RANGE, and WEIGHT are used in the interpolation scheme which will be described later. Once the interpolated rain and error values have been computed for each control station, the five preliminary estimates are computed. G is simply the interpolated rainfall field; Q is the satellite estimate computed previously; Qa is the satellite estimate (Q) plus the interpolated error value (the error value adjusts the satellite estimate); Om is the mean of the interpolated rainfall field and the satellite estimate; and Qam is the mean of Qa and the interpolated rainfall field. From these values an error is computed for each of the five estimates and the absolute value summed for all control stations. The method with the lowest total error is proclaimed the official method or "winner" for the day. Once the winner has been found, the control station gage readings are incorporated into the winning method and the final estimate is computed. When G wins, subroutine INTERP computes the interpolated rainfall field for the entire state using both control and analysis stations. When Q wins, the previously computed satellite estimate is the field estimate (but all observed gage readings override the satellite in their cells.) When Qa wins, INTERP computes the interpolated error field for the entire state, which is then added to the satellite estimate, producing the final estimate. When Qm wins, INTERP computes the interpolated rainfall field and the final estimate is the mean

of this field and the satellite estimate. When Qam wins, INTERP computes both the interpolated rain and error fields, the satellite estimate is added to the error field (Qa field) and the final estimate is the mean of this field and the interpolated rain field. See Figure 3-1 for general flow diagrams.

The curve first used in automated technique relating cloup top temperature to hourly precipitation actually consists of two linear curves with different slopes. -32°C corresponds to 0.01 inch and -56°C corresponds to 0.25 inch; that is, rain increases by 0.01 inch for each 1°C decrease in temperature. Thereafter rain increases by 0.05 inch for each 1°C decrease in temperature of the cloud top. Thus -83°C corresponds to 1.60 inches of rain per hour, and the atmosphere should seldom become colder than this.

For the storm of August 15-16, 1980, the first storm analyzed by the new automated technique, a number of stations which report hourly precipitation amounts were compared with the corresponding cloud top temperature in the pictures at the beginning and end of the hour. A new curve was generated from the resulting scatter diagram. For this curve, -24°C corresponds to 0.01 inch, and -56°C corresponds to 0.17 inch, for an increase of 0.01 inch for each 2°C decrease in temperature. Thereafter rain increases 0.06 inch for each 1°C decrease in temperature, reaching 1.80 inches at -83°C. (See Figure 3-2.)

Both curves have been applied to each of the 1980-81 storms studied. The verifications are listed in Tables 5-1 through 5-22. As a result, the old curve has been adopted as official.

The stations used in analysis and verification of 1978 storms (Figure 2-1) are not uniformly distributed, but these were the only available stations which report at or near 7 a.m. EST (1200Z.) By August 1980 several of these stations had been discontinued, while a considerable number had been added. Figure 3-3 shows the location of stations used in analyzing and verifying the storms of 1980 and 1981. Twelve Nationwide Agricultural Touchtone System (NATS) stations, recruited by VPI&SU, are included. The distribution still leaves eastern Virginia and the southwestern counties under populated. These gaps are to be filled with NATS stations in the near future. Also the delayed stations, which report in the CDS several months late, will have to be replaced unless the observer can be induced to report in real time via NATS.

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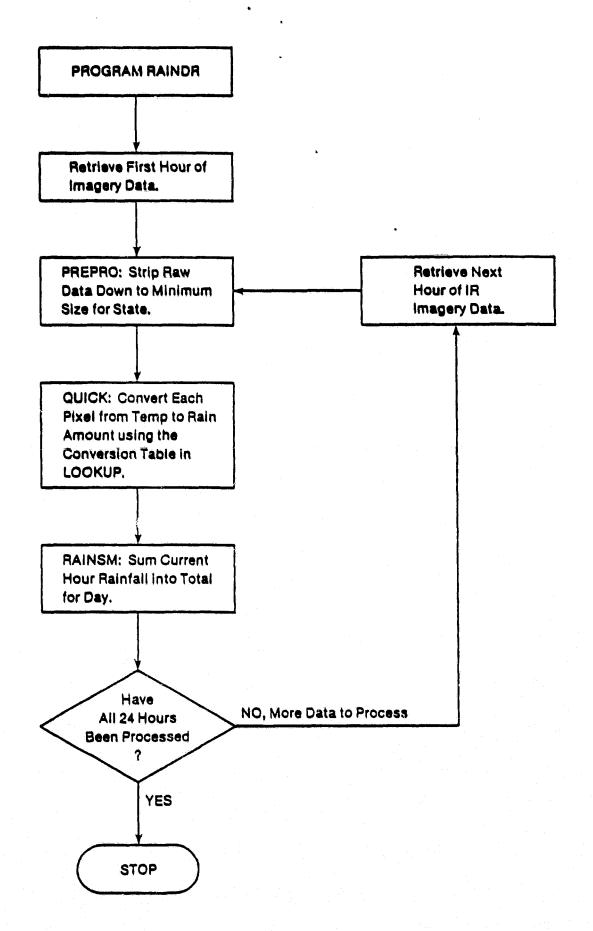


Figure 3-1. Program RAINDR 3-4

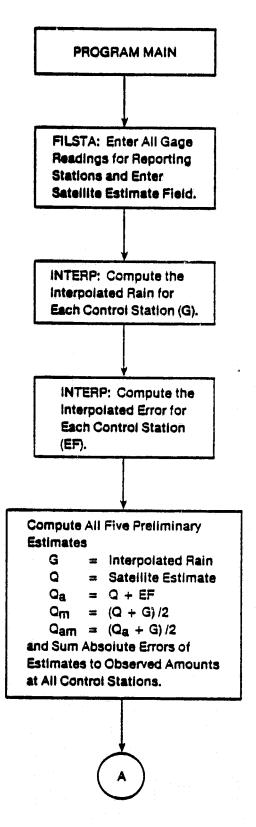


Figure 3-1. Program MAIN

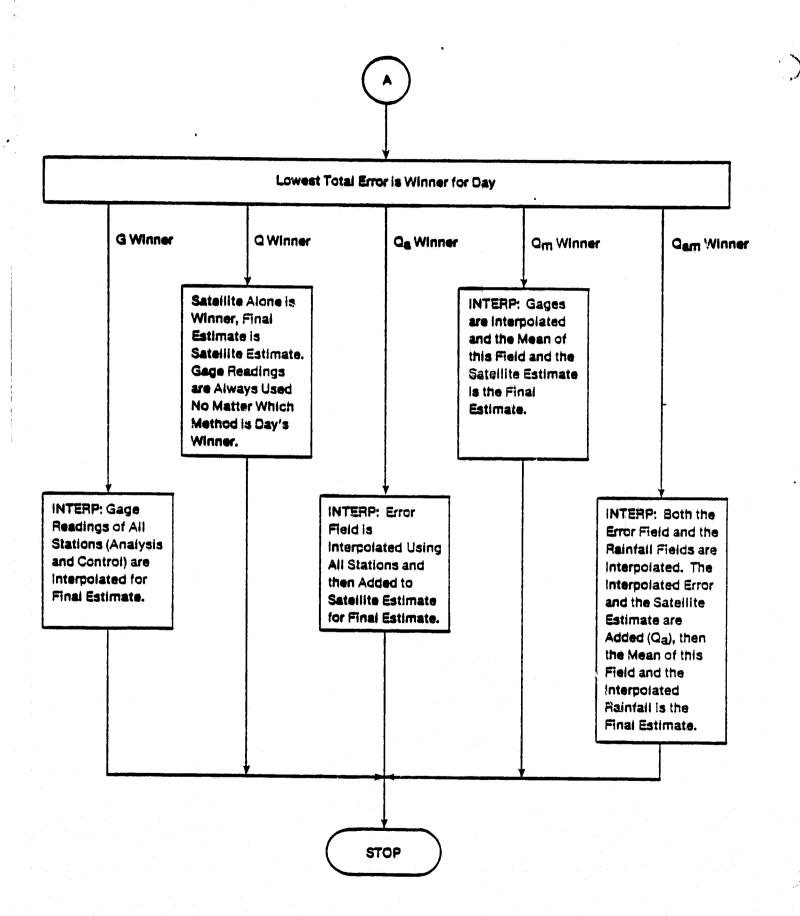


Figure 3-1. Lowest Total Error

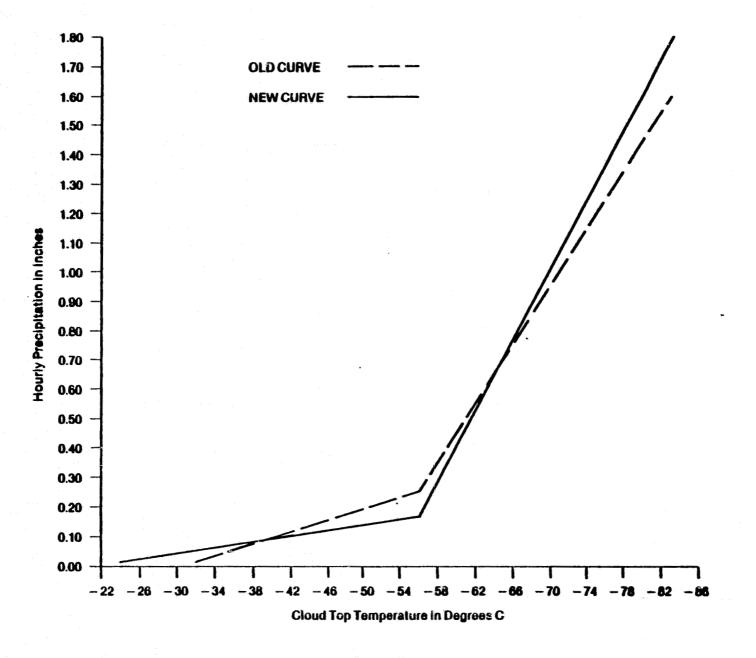
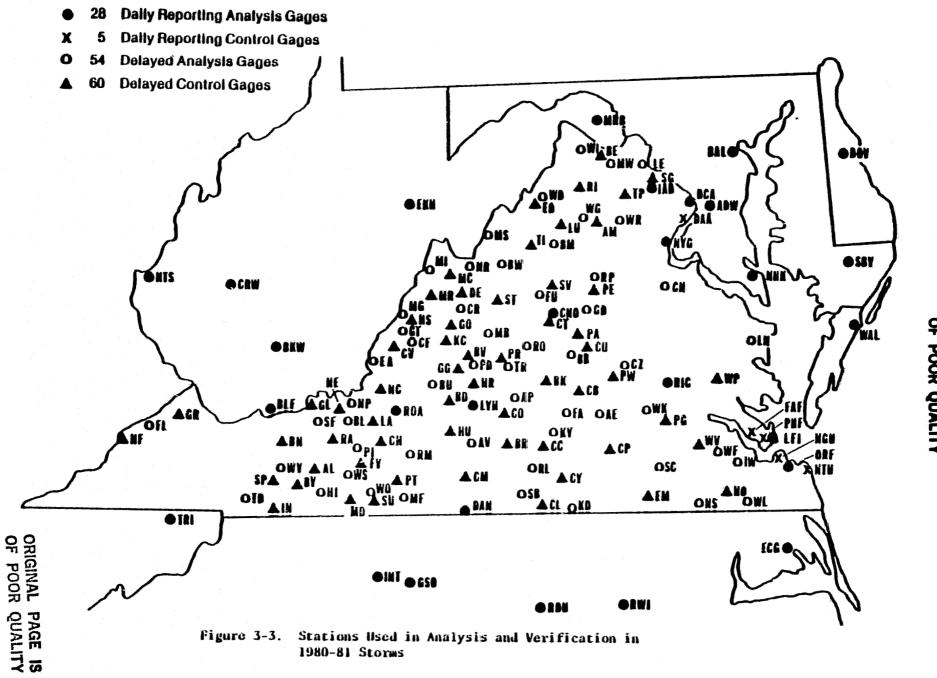


Figure 3-2. Cloud Top Temperature vs Precipitation - Old and New Curves Used in 1980-81 Storms





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The automated technique generates five fields of 24-hour precipitation estimates for the state of Virginia, tests each field against control data, and chooses (for the day in question) the field which makes the best score. The fields, designated G, Q, Qm, Qa and Qam, may be subdivided into preliminary and final fields as the technique proceeds. Each field consists of 2885 rectangular cells which cover the state.

All 24-hour rain gage readings taken at or near 7 a.m. EST (noon GMT) are ingested by the mini-computer, which interpolates between the analysis stations to get the preliminary G field. The control gage readings are stored by the computer for future use. The preliminary G field provides a 24-hour estimate of precipitation for each cell in the state for the period from 7 a.m. to 7 a.m. EST (1200Z to 1200Z.)

Hourly digital IR imagery for the 24-hour period is received via auto-dial from the NMC data tank. The mini-computer assigns an hourly precipitation estimate to each cell in Virginia, using the curve relating cloud top temperature to precipitation. The hourly precipitation estimates are summed by the comptuer to provide a 24-hour total for each cell. This is the preliminary O field.

Each observed gage measurement is considered ground truth for the 9.7 by 6.2 km cell in which the gage is located. This observed value overrides any estimate based on the satellite data in that cell. Therefore the computer compares the observed amount at each <u>analysis</u> station with the satellite (Q) estimate for that cell, the difference being the error in the Q field in that cell. An error field for Q is then obtained by interpolation between all analysis stations, but <u>not</u> the control stations. This error field is used to modify all cells in the Q field. These modified cells comprise the Qa field, or the adjusted satellite field.

For example, suppose that cell A lies somewhere between cells B, C, D and E, which contain analysis stations (see Figure 5-4.) To obtain the probable error in the Q field at cell A, the Q field errors at B, C, D and E are given weights in proportion to the inverse (reciprocal) of their respective distances from A. Distances between cells are measured from cell center to cell center. Say that B lies 50 km southwest of A; C lies 40 km westnorthwest of A; D is 70 km north of A; and E is 60 km east of A. We'll ascume that no other analysis station lies within 100 km of A (the technique's arbitrary cut-off distance for influence.) The influence B exerts on A

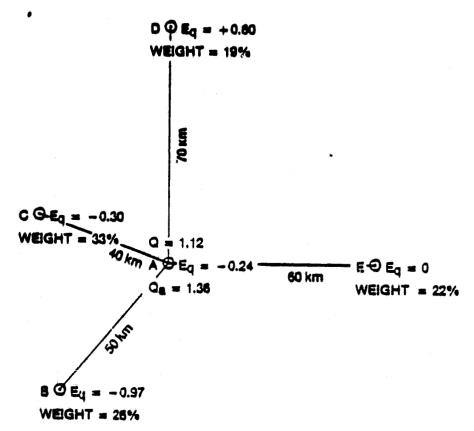


Figure 3-4. Interpolation Procedure as used to Derive Q Error Field

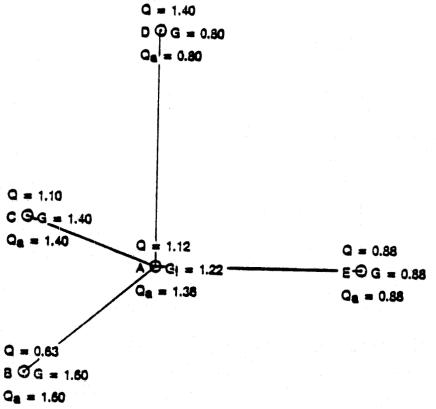


Figure 3-5. Interpolation Procedure as used to Derive G Field

is proportional to the inverse of the distance from A to B; that is, the reciprocal of 50, or 0.02. C's influence is the reciprocal of 40, or 0.025. D's influence is 0.014, and E's influence is 0.017. The total influence is their sum, which is 0.076. This assigns B 26% of the weight, C 33%, D 19% and E 22%. If the Q error at B is, say, -0.97, at C is -0.30 inch, at D is +0.60 inch, and at E is zero, then B will contribute -0.252 inch to the error at A, C will contribute -0.099 inch, D will contribute +0.114 inch, and E will contribute zero. The algebraic sum is -0.237, or -0.24 inch, the probable error in the Q field at A. If the Q value at A is, say, 1.12 inches, then the Qa value at A will be 1.36 inches.

At this point the computer could perform this adjustment of the Q estimates for each cell in the state to derive the Qa field, but in practice it now makes the adjustment at the control station only. Note that the Qa value at each analysis station will equal the observed gage measurement, but that Qa will rarely equal the gage measurement at each control station.

The next step is to derive the Qm field. The computer performs this task by taking the mean of G and Q values in each cell. However, at each analysis station the gage reading will override any differing Q value in that cell. That is, in each analysis gage cell, G=Q=Qm.

The Qam field is derived in the same way, by determining the mean between the G and Qa values in each cell in that state.

For verification, an error is computed for each field at each of the control stations. The errors for each field are summed, and the field with the least absolute error is chosen as the "best" precipitation field for the 24-hour period in question. This is sti a preliminary field. It must now be adjusted by means of a control gage readings, which up to this point have not been used in any of the analyses, to get the final official precipitation field for the day.

The example in Figure 3-4 is further expounded in Figure 3-5. Hypothetical G and Q values have been entered at points B, C, D and E, and are compatible with the errors in Q shown in Figure 3-4. Multiplying the G values, i.e. 1.60, 1.40, 0.80 and 0.88 by 26%, 33%, 19% and 22%, respectively, and summing, we get an interpolated G estimate, G_{i} , of 1.22 inches at A. The Qm estimate at A is the mean of the G and Q values, or 1.17 inches. The Qam estimate is the mean of the G and Qa values, or 1.29 inches. (Note that G and Qa do not have the same value at A, since G is merely interpolated,

not ground truth. Also note that Q at point A is not an interpolation of the Q values at B, C, D and E, since it has been derived directly from the satellite imagery.)

Assume that point A is a control station. In this event, the measured amount at A is ground truth and will be used to determine the error at A of each estimate field. The estimates, of course, will have no influence on the observed amount. In our example, if the observed precipitation at A is 1.32 inches, then the errors are G=-0.10, Q=-0.20, Qm=-0.15, Qa=+0.04, and Qam=-0.03 inch.

The computer compares the estimate obtained by each of the five methods at each control point with the corresponding gage measurement and computes the correlation coefficient, R, for each method. Normally the method with the smallest total absolute error will have the highest correlation coefficient, but when two methods are virtually equal in least total absolute error, R may be used as a tie-breaker.

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SECTION 4 - CRITIQUE OF AUTOMATED TECHNIQUE

The temperature of cloud tops depicted in infrared satellite imagery accounts for some of the variability in precipitation under those clouds. A scheme which attempts to estimate precipitation from cloud top temperature alone suffers from great over-simplification and can attain only limited success. Alternatively, the inclusion of other parameters (not including observed rainfall) complicates the procedure, necessitating either more complex computer modelling or the services of an on-the-job satellite meteorologist. The meteorologist would take cognizance of the following rules, among others:

- (1) Shields of cirrus and cirrostratus are cold, but taken alone produce no precipitation.
- (2) In the convective regimes of warm weather, thunderstorms and heavy rain tend to be concentrated in the sharply defined upwind (at cirrus level) portion of the cold cloud mass rather than in the filmy ill-defined downwind portion.
- (3) Convective cells are often embedded in synoptic-scale systems, particularly in colder months, but are detected only with difficulty by the satellite meteorologist.
- (4) Heavier precipitation generally occurs in the comma cloud, in areas of maximum positive vorticity advection, and near the inflection point of the jet stream over or near a front as delineated in the satellite imagery.
- (5) On occasion the coldest clouds over the state will be non-precipitating debris from old systems, while somewhat warmer clouds are producing copious rain or snow.

The expertise of a trained satellite meteorologist on a continuing basis is required to recognize and cope with situations such as those referred to in the above examples. It is with this in mind that we should evaluate any shortcomings of the automated technique, which does have the decided advantage of requiring no expert input.

Missing data, and garbled data received by auto-dial from the NMC computer, have plagued the investigation and may well plague operations in future. (Fifteen out of 24 hours of data were missing during the storm of March 5-6, 1981, and 14 hours were missed during the September 17-18, 1980 storm. (see Table 4-1) Interpolation algorithms are fairly reliable when a single

Table 4-1: Pixel Shift, Observed Storm Total (Precipitation), and Number of Control Stations, Analysis Stations and Missing Hours of Satellite Data for Storms of 1980 and 1981

Stor	m Date	Pixel Shift	Storm Total#	Control Stations	Analysis Stations	Missing Hours
19	80					
Aug	15-16	3S 1E	7.61	47	63	11
Sep	9-10	3S 2E	4.75	51	. 61	12
Sep	16-17	2S 0	0.24	52	66	10
Sep	17-18	5S 1E	20,36	56	73	14
Sep	24-25	25 2W	27.12	56	69	10
Sep	25-26	25 1W	3.61	53	68	7
Oct	24-25	0 1E	41.13	49	63	3
Nov	15-16	4S 0	5,71	48	59	5
Nov	17-18	15 1W	39.75	52	71	4
Dec	9-10	2S 0*	11.24	53	80	7
19	81					
Mar	4-5	15 0	25.56	57	88	6
Mar	5-6	152W	2.23	54	68	15
Mar	16-17	25 0*	4.85	50	62	7
Mar	22-23	25 0*	25.26	53	67	12
Mar	29-30	25 0*	9.99	51	64	. 4
Mar	30-31	15 2W	22.20	51	58	7
Apr	14-15	2S 0*	12.40	53	74	6
May	15-16	2S 0*	5.08	53	62	7
May	18-19	2S 0*	31.66	53	66	9
May	19-20	2S 0*	26.47	53	64	9
Jul	21-22	1N 2W	2.69	17	32	6

[#] Inches. *Overall mean shift.

hour of data is missing. A particularly unsatisfactory situation is several hours of missing data at the very beginning or end of the day, with no anchor point for the interpolation. Recently reception has improved, but three or four missing hours per day is not uncommon. Garbling, a very serious problem in the early stages of the investigation, has been nearly eliminated.

The digital imagery received via auto-dial consists of an array of 129 by 129 pixels. The picture center (the 65th pixel of the 65th row) is supposed to be at 37° north latitude, 79° west longitude, about five kilometers southwest of Brookneal, Virginia. Cloud features in actual satellite EIR photographs (Figure 4-1) were carefully compared with the corresponding features in the digital imagery accessed by auto-dial (Figure 4-2.) In 13 storms occurring between August 1980 and March 1981, geographical location of the clouds was somewhat different in the two types of imagery. In general it was necessary to shift the digital pixels to the north to bring cloud patterns into line with their counterparts in the EIR photographs. Put another way, it was necessary to examine pixels to the south of the 65th pixel of the 65th row to find clouds over 37° north, 79° west (picture center). The actual shift of the stations varied from storm to storm, and even from hour to hour, but averaged two pixels south and almost one-half pixel east for all cases. That is, instead of looking for the cloup top temperature over Richmond at the 88th pixel in the 59th row (the nominal position for Richmond) we should expect it in the 88th pixel (or perhaps the 89th) in the 61st row. We have not found the reason for this shift, but NMC is aware of it and is attempting to solve the problem.

Figure 4-1 is the EIR photograph taken by the geostationary satellite at 0300Z August 16, 1980, showing cloud features in relation to geographical landmarks. Figure 4-2 is the corresponding digital imagery for 0300Z August 16, 1980, accessed by auto-dial. Careful examination of clouds in relation to landmarks shows that corrections in registration must be made in the digital product to bring it into alignment with the EIR photograph (which has been quite accurately registered by the National Environmental Satellite Service). These corrections are indicated in Table 4-2. The shift column shows the direction of the error. The correction must be made in the opposite direction.

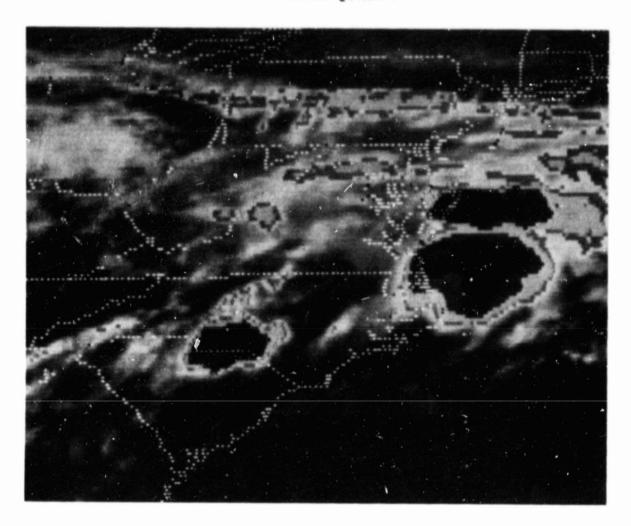


Figure 4-1. EIR Photograph taken at 0300Z August 16, 1980 showing Cloud Features in Relation to Landmarks

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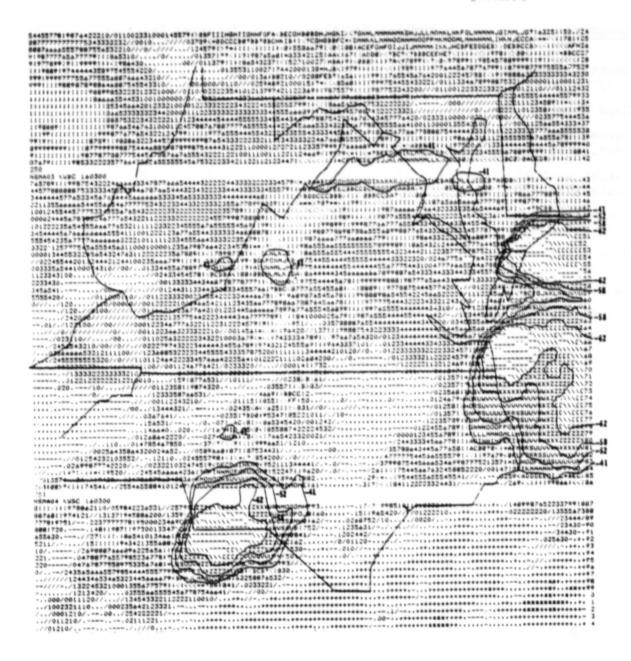


Figure 4-2. Digital Imagery Accessed by Auto-dial at 0300Z August 16, 1980 showing Cloud Features in Relation to Landmarks

Table 4-2. Apparent Shift in Landmark Positions in Digital 'Imagery for 0300Z August 16, 1980

Landmark	Nominal Position Row Column		Observed Position Row Column		Shift	
Southeast corner of Virginia	70	109	73	108.5	38	0.5W
Cape Charles	63	108	65.5	107	2.55	1W
Corner west of Charlotte, NC	85	35	87	38	25	3E
Corner west of Laurenburg, NC	90	55	92.5	56	2.58	1E
Southwest corner of Delaware	48	112	48	110	0	2W
Mean Shift					25	0.1E

Similar shifts were determined for the imagery for 2000Z, 2100Z and 2200Z of August 15, 1980, and for 0000Z, 0100Z, 0200Z, 0400Z and 0600Z of August 16, 1980. The average shift for the storm day was 3 south 1 east. Four additional landmarks were used in the full day analysis: the southwest tip of Maryland (row 59/column 58); the junction of Ohio, Kentucky and West Virginia (row 48/column 13); the junction of Virginia, Tennessee and North Carolina (row 69/column 26); and Picture Center (row 65/column 65).

Another source of possible error, which applies equally to the EIR photographs and the digital imagery, is parallax due to the angle at which the satellite over the equator at 75° west longitude photographs the clouds. A 40,000 foot cloud top over Virginia appears to be about 6.5 nautical miles north of its true position. A 30,000 foot cloud top has an apparent displacement of 5.3 nautical miles, or 9.8 km, the north-south dimension of a pixel in the latitude of Virginia. The computer program carries a correction for this parallax phenomenon.

SECTION 5 - ANALYSIS OF EXPERIMENTAL STORMS OF 1980-81

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The automated technique has tested on 21 storms which occurred in 1980 and 1981. Composite scores for these storms are shown in Table 5-1. The scores attained by each of the five methods are tabulated in Tables 5-2 through 5-22. Table 5-23 shows how frequently each method had the highest correlation coefficient (estimated vs observed precipitation), the least mean absolute error, and the least mean algebraic error (overestimates and underestimates). The G method makes the highest scores overall, somewhat better with the old curve (cloud top temperature vs precipitation) than with the new curve. The Qam method does well in least mean absolute error, particularly with the new curve. Qa scores well in bias (mean algebraic error), leading on six storms (29 percent) with each curve.

While the technique is designed primarily to estimate growing season rain, most of it convective in nature, only five of the 21 storms in the study were typical airmass storms. The remaining 16 were associated with fronts and synoptic-scale low pressure systems. Appendix B gives a brief description of the synoptic situation for each of the storms.

The original computer program was completed and the link with NMC's computer was established in August 1980. Four summer storms were accessed and analyzed between August 15 and September 21, 1980. Among these the "storm" of September 16-17 produced very little rain. Subsequently six storms in autumn, three in winter and seven in spring were studied. Storms over Virginia were scarce in the summer of 1981, and the storm of July 21-22, 1981 alone was accessed and analyzed. Only 17 control stations and 29 analysis stations were available for this storm; the results therefore should be viewed with caution.

In view of the scarcity of summer airmass storms during the experimental period from August 1980 to July 1981, the uniform rainfall patterns observed should not be surprising. A good example of uniform distribution is the weak storm of April 14-15, 1981. (See Figure 5-1..) Heaviest rain in Virginia (one-half to three-quarters of an inch) occurred in an eliptical area extending between Trout Dale and Hillsville in the southwest part of the state. Most other sections had between 0.1 and 0.4 inch, and only three reporting points had no rain. Whenever such uniformity prevails the interpolation algorithm incorporated into the program makes the "gages only" routine hard to beat by any satellite method.

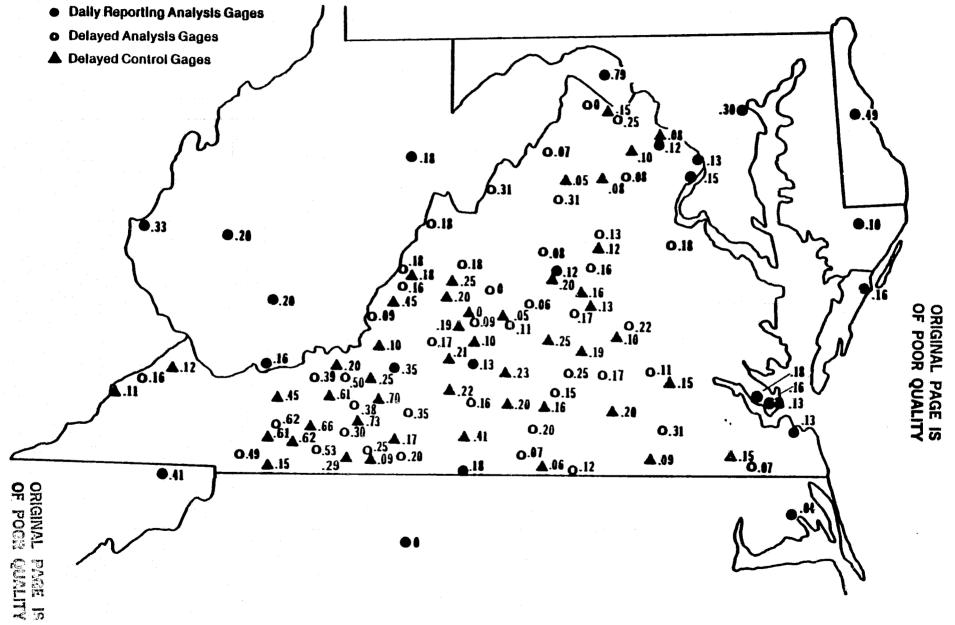


Figure 5-1. Precipitation Pattern on April 14-15, 1981

Table 5-1. Composite Scores for each Method for 21 Storms in 1980-81

Old Curve	Q	G	Qa	Qm	Qam
Mean Absolute Error (inches)	0.525	0.123	0.181	0.295	0.145
Mean Algebraic Error (inches)	+0.310	+0.004	+0.043	+0.157	+0.024
New Curve					
Mean Absolute Error (inches)	0.547	0.123	0.172	0,311	0.143
Mean Algebraic Error (inches)	+0.428	+0.004	+0.042	+0.216	+0.023

N=1062. Best scores underlined.

	Table 5-2. S	cores for S	torm August 15	-16, 1980	
Qld Curve	Q	G	Qa	Qm	Qam
Correlation Coefficient	0.687	0.836	0.800	0.768	0.863
Mean Absolute	0.259	0.093	0.110	0.159	0.089
Mean Algebraic	+0.206	- <u>0.001</u>	+0.037	+0.103	+0.018
New Curve					
Correlation Coefficient	0.715	0.836	0,771	, 0.788	0.853
Mean Absolute Error*	0.411	0.093	0.116	0.229	0.091
Mean Algebraic Error*	+0.403	- <u>0.002</u>	+0.025	+0.201	+0.010
N=47. Mean	Rain at Control	l Station:	0.162 inch.	*Inches.	
_ 1	Sable 5-3. Sco	ores for St	orm September 9	-10, 1980	
Old Curve	Q	G	Qa	Qm	Qam
Correlation Coefficient	0.466	0.832	0.624	0.687	0.770
Mean Absolute Error*	0.214	0.056	0.089	0.125	0,065
Mean Algebraic Error*	+0.170	-0.020	+0.001	+0.075	-0.010
New Curve					
Correlation Coefficient	0.490	0.832	0.647	0.718	0.773
Mean Absolute Error*	0.240	0.056	0.077	0.141	0.060
Mean Algebraic Error*	+0.201	-0.020	-0.007	+0.090	-0.014
N=51. Mean	Rain at Contro	1 Stations:	0.093 inch.	*Inches.	

	Table 5-4.	Scores for St	orm September	16-17, 1980	
Old Curve	Q	G	Qa	Qm	Qam
Correlation Coefficient	-0.087	0.452	0.077	-0.020	0.193
Mean Absolute Error*	0.024	0.006	0.013	0.015	0.010
Mean Algebraic Error*	+0.015	-0.002	+0.004	+0.006	+0.001
New Curve					
Correlation Coefficient	-0.161	0.452,	-0.086	-0.118	0.075
Mean Absolute Error*	0.072	0.006	0.014	0.039	0.010
Mean Algebraic Error*	+0,065	-0.002	+0.005	+0.032	+0.002
N=52. Mean	n Rain at Con	trol Station:	0.005 inch.	*Inches.	
	Table 5-5.	Scores for St	orm September	17-18, 1980	
Old Curve	Q	G	Qa	Qm	Qam
Correlation Coefficient	0.183	0.619	0.642	0.605	0.637
Mean Absolute Error*	0.351	0.227	0.232	0.260	0.229
Mean Algebraic Error*	-0.307	- <u>0.051</u>	-0.060	-0.179	-0.055
New Curve					
Correlation Coefficient	0.276	0.619	0.637	0.609	0.631
Mean Absolute Error*	0.316	0.227	0.229	0.251	0.228
Mean Algebraic Error*	-0.246	- <u>0.051</u>	-0.057	-0.148	-0.054
N=56. Mean	n Rain at Con	trol Stations:	0.364 inch.	*Inches.	

	Table 5-6. Sc	ores for Sto	rm September 2	4-25, 1980	
Old Curve	Q	G	Qa.	Qm	Qam
Correlation Coefficient	0.009	0.501	0.326	0.298	0.425
Mean Absolute Error*	0.397	0.252	0.280	. 0.287	0.262
Mean Algebraic Error*	-0.293	-0.031	- <u>0.027</u>	-0.162	-0.029
New Curve					
Correlation Coefficient	-0.026	0.501	0.405	0.384	0.462
Mean Absolute Error*	0.323	0.252	0.265	0.270	0.258
Mean Algebraic Error*	-0.112	-0.031	-0.022	-0.071	-0.026
N=56. Mean	n Rain at Contro	1 Station:	0.484 inch.	*Inches.	
	Table 5-7. Scor	es for Storm	September 25-	26, 1980	
Old Curve	Q	G	Qa	Qm	Qam
Gorrelation Coefficient	00002	0.263	0.057	0.032	0.152
Mean Absolute Error*	1.014	0.071	0.115	0.512	0.089
Mean Algebraid Error*	+1.013	+0.010	+0.037	+0.512	+0.024
New Curve					
Correlation Coefficient	0.015	0.263	0.205	0.062	0.252
Moan Absolute Error*	1.154	0.071	0.089	0.582	0.078
Mean Albebrai Error*	c +1.154	+0.010	+0.022	+0.582	+0.016
N=53. Mea	n Rain at Contro	l Stations:	0.068 inch.	*Inches.	

	Table 5-8.	Scores for Sto	orm October 24	-25, 1980	
	Q	G	Qa.	Qm	Qam
Old Curve					
Correlation Coefficient	0.429	0.575	0.575	0,556	0.583
Mean Absolute Error*	0.504	0.268	0.288	0.316	0.268
Mean Algebraic Error*	-0.282	+0.054	+0.075	0.114	+0.064
New Curve			, i		
Correlation Coefficient	0.456	0.575	0.590	0.578	0.588
Mean Absolute Error*	0.377	0.268	0.275	0.289	0.266
Mean Algebraic Error*	-0.106	+0.054	+0.077	- <u>0.026</u>	+0.066
N=49. Mean	n Rain at Con	trol Station:	0.839 inch.	*Inches.	
	Table 5-9.	Scores for S	torm November	15-16, 1980	
Old Curve	Q	G	Qа	Qm	Qam
Correlation Coefficient	0.111	0.530	0.240	0.148	0.288
Mean Absolute Error*	0.457	0.060	0.304	0.247	0.177
Mean Algebrai Error*	c +0.340	+0.002	0.237	+0.171	+0.120
New Curve					
Correlation Coefficient	0,093	0.530	0.225	0.125	0.268
Mean Absolute Error*	0.884	0.060	0.337	0.446	0.194
Mean Algebrai Error*	c +0.884	+0.002	+0.269	+0.443	+0.135
N=48. Mea	n Rain at Con	trol Stations:	0.119 inch.	*Inches.	

Т	able 5-10.	Scores for Sto	orm November 1	7-18, 1980	
01d Curve	Q	G	Qa.	Qm	Qam
	A 2/2	0.400	0.504	0 501	0.404
Correlation Coefficient	0.363	0.682	0.506	0.591	0.606
Mean Absolute Error*	0.477	0.186	0.221	0.280	0.202
Mean Algebraic Error*	-0.428	+0.018	+0.031	-0.205	+0.025
New Curve					
Correlation Coefficient	0.425	0.682	, 0.551	0.608	0.625
Mean Absolute Error*	0.286	0.186	0.210	0.221	0.196
Mean Algebraic Error*	-0.135	+0.018	+0.018	-0.058	+0.018
N=52. Mean Rai	n at Control	Station: 0.7	64 inch. *	Inches.	
1	Table 5-11.	Scores for St	orm December 9	-10, 1980	
01d Curve	Q	G	Q a	Qm	Qam
Correlation Coefficient	-0.089	0.197	0.078	-0.056	0.129
Mean Absolute Error*	1.663	0.096	0.213	0.836	0.136
Mean Algebraic Error*	+1.663	+0.009	+0.061	+0.836	+0.035
New Curve					
Correlation Coefficient	-0.136	0.197	0.006	-0.081	0.077
Mean Absolume Error*	1.638	0.096	0.170	0.824	0.120
Mean Algebraic Error*	+1.638	+0.009	+0.041	+0.824	+0.025
N=53. Mean	Rain at Cont	rol Stations:	0.212 inch.	*Inches.	

	Table 5-12.	Scores for	Storm March 4-	5, 1981	
Old Curve	Q	G	Qa	Qm	Qam
Correlation Coefficient	-0.027	0.726	0.207	0.063	0.297
Mean Absolute Error*	1.112	0.087	0.494	0.560	0.274
Mean Albebraic Error*	+1.112	+0.007	+0.315	+0.559	+0.161
New Curve					
Correlation Coefficient	-0.018	0.726	0.210	0.066	0.291
Mean Absolute Error*	1.205	0.087	0.533	0.606	0.289
Mean Algebraic	+1.205	+0.007	+0.362	+0.606	+0.184
N=57. Mean	Rain at Contro	ol Station:	0.448 inch.	*Inches.	•
	Table 5-13.	Scores for	Storm March 5-6	, 1981	
Old Curve	Q	G	Qa	Qm	Qam
Correlation Coefficient	0.257	0.532	0.545	0.564	0.539
Mean Absolute Error*	0.041	0.046	0.045	0.033	0.045
Mean Algebraic Error*	-0.038	+0.027	+0.025	-0.005	+0.026
New Curve					
Correlation Coefficient	0.030	0.532	0.495	0.386	0.524
Mean Absolute Error*	0.149	0.046	0.051	0.094	0.047
Mean Algebraic Error*	+0.134	+0.027	+0.026	+0.081	+0.026
N=54. Mean	Rain at Contro	l Stations:	0.041 inch.	*Inches.	

	Table 5-14.	Scores for	Storm March 16	-17, 1981	
Old Curve	Q	G	Qa	Qm	Qam
Correlation Coefficient	0.059	0.658	0.482	0.510	0.587
Mean Absolute Error*	0.107	0.059	0.082	0.079	0.069
Mean Algebraic Error*	-0.004	-0.005	+0.005	-0.005	-0.00045.
New Curve					
Correlation Coefficient	0.289	0.658	0.604	0.559	0.643
Mean Absolute Error*	0.308	0.059	0.067	0.164	0.060
Mean Algebraic	+0.299	-0.005	-0.005	+0.147	-0.005
N=50. Mean	Rain at Contro	l Station:	0.097 inch.	*Inches.	
	Table 5-15. S	cores for S	torm March 22-2	23, 1981	
Old Curve	Q	G	Qa _	Qm	Qam
Correlation Coefficient	-0.062	0.805	0.762	0.411	0.803
Mean Absolute Error:	1.652	0.148	0.182	0.862	0.154
Mean Algebraic Error:	+1.647	+0.062	+0.051	+0.854	+0.057
New Curve					
Correlation Coefficient	-0,022	0.805	0.799	0.598	0.809
Mean Absolute Error:	1.330	0.148	0.150	0.699	0.145
Mean Algebraic	+1.330	+0.062	+0.051	+0.696	+0.056
N=53. Mean	Rain at Contro	l Stations:	0.477 inch.	*Inches.	

Table 5-16. Scores for Storm March 29-30, 1981

Old Curve	Q	G	Qa	Qm	Qam
Correlation Coefficient	0.432	0.714	0.392	0.552	0.616
Mean Absolute	1.022	0.113	0.161	0.499	0.130
Mean Algebraic	+1.012	-0.052	+0.004	+0.480	-0.024
New Curve					
Correlation Coefficient	0.437	0.714	0.555	0.587	0.671
Mean Absolute Error*	1.058	0.113	0.137	0.517	0.123
Mean Algebraic Error*	+1.054	-0.052	-0.020	+0.501	-0.036
	at Control S	tations: 0.1	96 inch.	*Inches.	
	Table 5-17.	Scores for S	torm March 30	0-31, 1981	
Old Curve	Q	G	Qa	Qm	Qam
Correlation Coefficient	0.170	0.498	0.445	0.456	0.484
Mean Absolute Error:	0.475	0 174			_
	- :	0.174	0.203	0.298	0.184
Mean Algebraic Error:	+0.413	- <u>0.016</u>	0.203 - <u>0.034</u>	0.298	0.184
		· · · · · · · · · · · · · · · · · · ·			
Error:		· · · · · · · · · · · · · · · · · · ·			
Error: New Curve Correlation	+0.413	-0.016	-0.034	+0.199	-0.025
New Curve Correlation Coefficient Mean Absolute	+0.413	0.498	- <u>0.034</u> 0.493	+0.199 <u>0.523</u>	-0.025 0.500

	Table 5-18.	Scores for St	orm April 14-1	5, 1981	
Old Curve	Q	G	Q a	Qm	Qam
34 -	0.074	0.745	0.474	0.450	0 547
Correlation Coefficient	0.274	0.565	0.434	0.450	0.543
Mean Absolute Error*	0.213	0.112	. 0.144	. 0.142	0.116
Mean Albebraic Error*	+0.039	-0.012	-0.008	+0.014	-0.010
New Curve					
Correlation Coefficient	0.067	0.565	0.448	0.304	0.539
Mean Absolute Error*	0.268	0.112	0.131	0.176	0.115
Mean Algebraic Error*	+0.204	-0.012	-0.013	÷0.096	-0.012
N=53. Mean	Rain at Cont	rol Station:	0.234 inch.	*Inches.	
	Table 5-19.	Scores for St	orm May 15-16	, 1981	
Old Curve	Q	G	Qa	Qm	Qam
Correlation Coefficient	0.683	0.620	0.732	0.741	0.689
Mean Absolute Error*	0.067	0.067	0.059	0.055	0.059
Mean Algebraic Error*	-0.062	+0.003	-0.005	-0.029	-0.001
New Curve					
Correlation Coefficient	0.624	0.620	0.716	0.718	0.674
Mean Absolute Error*	0.064	0.067	0.057	0.058	0.060
Mean Algebraic Error*	-0.051	+0.003	-0.008	-0.024	-0.003
N=53. Mean	Rain at Con	trol Stations:	0.096 inch.	*Inches.	

	Table 5-20.	Scores for S	torm May 18-19	, 1981	
	Q	G	Qa.	Qm	Qam
Old Curve					
Correlation Coefficient	0.498	0.544	0.588	0.585	0.611
Mean Absolute Error*	0.310	0.208	0.213	0.221	0.196
Mean Algebraic Error*	+0.049	+0.040	+0.045	+0.045	+0.043
New Curve		•			
Correlation Coefficient	0,556	0.544	0.625	0.634	0.617
Mean Absolute Error*	0.326	0.208	0.197	0.237	0.195
Mean Algebraic Error*	+0.268	+0.040	+0.052	+0.154	+0.046
N=53. Mean	Rain at Contr	ol Station:	0.597 inch.	*Inches.	
	Table 5-21.	Scores for S	torm May 19-20	, 1981	
	Q	G	Qa	Qm	Qam
Old Curve					
Correlation Coefficient	0.483	0.559	0.570	0.628	0.594
Mean Absolute Error*	0.143	0.119	0.148	0.108	0.119
Mean Algebraic Error*	-0.063	+0.020	+0.067	-0.022	+0.043
New Curve					
Correlation Coefficient	0.327	0.559	0.572	0.585	0.580
Mean Absolute Error*	0.182	0.119	0.128	0.124	0.118
Mean Algebraic Error*	+0.137	+0.020	+0.040	+0.078	+0.030
N=53. Mean Ra	in at Control	Stations: 0.	499 inch.	*Inches.	

	Table 5-22. S	cores for	Storm July 21		
	Q	G	Qa.	Qm	Qam
Old Curve					
Correlation Coefficient	0.389	0.788	0.575	0.531	0.695
Mean Absolute Error*	0.278	0.138	0.168	0.183	0.153
Mean Algebraic Error*	+0.174	+0.062	+ <u>0.056</u>	+0.118	+0.059
New Curve					
Correlation Coefficient	0.359	0.788	0.486	0.509	0.649
Mean Absolute Error*	0.281	0.138	0.183	0.185	0.161
Mean Algebraic Error*	+0.171	+0.062	+0.058	+0.117	+0.060
N=17. Mean	Rain at Control	Station:	0.158 inch	*Inches	

Table 5-23. Best Score Frequencies, Storms of 1980-1981

	Q	G	Qa	Qm	Qam
Old Curve		•			
Highest Correlation Coefficient	0	14	1	3	3
Least Mean Absolute Error	0	16	0	3	2
Least Mean Algebraic Error	o	11	6 .	1	3
New Curve					
Highest Correlation Coefficient	0	13	2	4	2
Least Mean Absolute Error	0	15	1	0	S
Least Mean Algebraic	0	11*	6*	1	3*

^{*} Includes ties

Precipitation for the storm of March 4-5, 1981 was more than double that for April 14-15. Again the distribution was quite uniform. (See Figure 5-2.) The G method easily beat the satellite methods in this storm.

The storm of October 24-25, 1980 was fairly uniform, but there were definite exceptions. (See Figure 5-3.) Deerfield (0.05 inch) is surrounded by stations with 0.54, 0.54 and 1.22 inches. Free Union (0.10 inch) is surrounded by stations with 0.54, 1.27, 0.91, 1.10, 1.33 and 2.08 inches. Qam verified best in this storm.

The storm of August 15-16, 1980 demonstrates the irregular patterns of summer. (See Figure 5-4.) Thunderstorms in southeastern Virginia and the Eastern Shore brought more than an inch in many places, and 4.13 inches to Norfolk. A gage near Virginia Beach received six inches in less than two hours. Significant rain occurred in irregular patterns in northern and north central Virginia, but most of the James River Basin above Richmond got no rain. The highest scores in this storm were made by Qam. Thus, as the rainfall patterns become more irregular, the satellite's contribution to the technique increases significantly.

Overall the highest correlations were obtained in the summer storm of August 15-16, but R was also relatively high in the storms of September 9-10, 1980 and May 15-16, 1981. The poorest correlations occurred on December 9-10, September 16-17, and September 25-26 (all 1980). Significantly, the mean of all correlation coefficients for Q, Qa, Qm and Qam for the colder period from September 16 to March 17 is a poor 0.300, while for the warmer period from March 22 to September 10 the mean is 0.560 (not that these dates are ideal cutoffs between warm and cold weather, but they do dramatically separate the lower scores from the higher.) These statements hold true regardless of which temperature vs precipitation curve is used. For the G method, however, \overline{R} = 0.520 during the colder period, and \overline{R} = 0.675 during the warmer period. In the colder period the G method has the highest R value in 73 percent of the storms when the old curve is used, and in 82 percent of the storms when the new curve is used. In the warmer period G has the highest R in 60 percent of the storms with the old curve, and only 40 percent with the new curve. In other words, the G method appears to be fairly reliable throughout the year, while the methods involving satellite data are competitive in the warmer months but suspect in the colder.

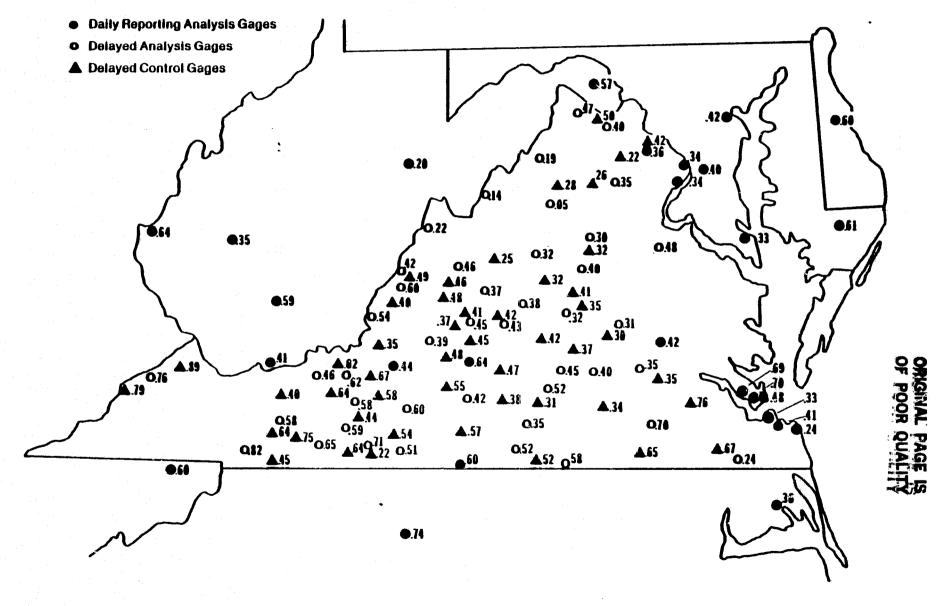


Figure 5-2. Precipitation Pattern on March 4-5, 1981

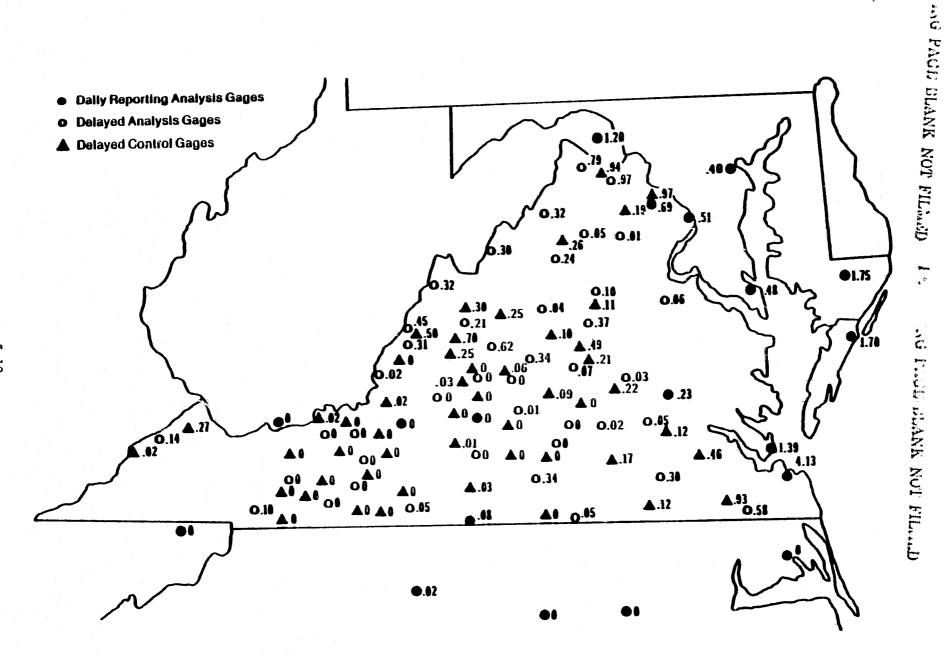


Figure 5-4. Precipitation Pattern on August 15-16, 1980

All methods overestimated rainfall in 1980 and 1981, while all methods underestimated the rain in 1978. Yet a comparison of Table 2-1 and Figure 3-2 would suggest the opposite. That is, the cloud top temperature vs. precipitation relationship used in 1978 should produce slightly higher estimates than either curve used in 1980 and 1981. The answer to this apparent paradox is that the period March to August 1978 had above normal precipitation while June 1980 to April 1981 was unusually dry.

In regions with very dry environments (deserts and temporary drought areas) disappointingly scant rain is produced as a rule by the occasional cumulonimbus that does occur, even when the convective chimney is quite large and tall. In very wet environments, on the other hand, rather innocuous appearing build-ups may bring surprisingly heavy rain. There is usually a lag of several months from the onset of the below normal rainfall which initiates the drought condition to the inhibiting effect on such cumulonimbus as do occur. A similar lag occurs in the excessively wet periods.

Departures from normal in precipitation for stations representing six geographical areas of Virginia are presented in Tables 5-24 and 5-25. Table 5-24 shows well above normal rainfall for the period March 1978 through August 1978, and below normal for the following two months. Table 5-25 shows large deficits for the period March 1980 through April 1981. The cumulative deficit ranges from -2.28 inches at Wytheville to -16.37 inches at Norfolk. Under these circumstances any predictive curve based on normal precipitation will underestimate in the wet periods and overestimate in the dry. However, an examination of the scores in Tables 2-2 through 2-9, and 5-1 through 5-22, will show that Q and Qm are the only methods that are seriously affected by these anomalous situations.

For the seven storms of 1978 taken together, the mean underestimate for Q is -0.20 inch, for Qm is -0.11 inch, and for G, Qa and Qam a negligible -0.01 inch. The worst score for a single storm is -0.69 inch for Q, -0.38 inch for Qm, -0.20 inch for G, -0.19 inch for Qam, and -0.17 inch for Qa. The large underestimates for Q and Qm occurred on May 4-5, 1978; those for G, Qam and Qa on July 31-August 1, 1978.

For the 21 storms of 1980-81 taken together, the mean overestimate for Q is +0.31 inch (old curve) and +0.43 inch (new curve); for Qm it is +0.16 inch (old curve) and +0.22 inch (new curve). Qa and Qam show negligible over-

Table 5-24. Departure from Normal in Precipitation, 1978 (inches)

1978	RIC	WY	LYH	ROA	ORF	IAD
March	+2.29	+0.90	+0.38	+2.59	+4.38	+2.85
April	+1,54	+1.90	+2.60	+4.74	+0.19	-1.34
May	+0.50	+0.26	+3.47	+1.38	+2.30	+1.37
June	+1.74	-1.45	-0.07	-1.46	+4.22	+0.75
July	-1.39	-0.27	+0.78	+0.93	-1.51	+0.40
August	+0.87	+4.13	-0.16	+2.18	-4.26	+0.04
Cumulative March-August	+5.55	+5,47	+7.00	+10.36	+5.32	+4.07
September	-3.32	-2.90	-3.28	-2.97	-3.03	-2.51
October	-1.73	-1.87	-1.76	-2,41	-1.56	-1.95
Cumulative September- October	-5.05	-4.77	-5.04	-5.38	-4.59	-4,46

Legend:

RIC = Richmond, Eastern Piedmont

WY = Wytheville, Southwestern Mountain

LYH = Lynchburg, Western Piedmont

ROA = Roanoke, Central Mountain

ORF = Norfolk, Tidewater

IAD = Dulles International Airport, Northern

Table 5-25. Departures from Normal in Precipitation, 1980-1 (inches)

1980	RIC	WY	LYH	ROA	ORF	TAD
June	-3.14	-1.06	-2.78	-1.70	-2,23	-1.72
July	-0.45	+2.93	-0.44	+1.44	-3.85	+0.29
August	-2.91	-2.25	-2.71	-1.28	-1.38	-2.58
September	-1.21	+0.27	-1.51	-1.76	-2.73	-0.59
October	+4.02	+0.67	-0.25	-0.89	+1.15	+0.03
November	-1.02	-0.65	+0.19	-0.70	-0.93	+0.36
December	-2.82	-1.98	-2.65	-2.51	-0.47	-2.79
1981	•					
January	-2.22	-1.47	-2.28	-2.45	-2.30	-2.44
February	-0.25	-0.05	+1.02	-0.66	-1.05	+1.49
March	-1.86	-1.14	-1.65	-1.03	-1.54	-2.49
April	+0.19	-0.36	-0.29	-1.05	-0.45	+0.09
Cumulative June-April	-11.67	-5.09	-13.35	-12.59	-15.78	-10.35

Legend:

RIC = Richmond, Eastern Piedmont

WY = Wytheville, Southwestern Mountain

LYH = Lynchburg, Western Piedmont

ROA = Roanoke, Central Mountain

ORF = Norfolk, Tidewater

IAD = Dulles Internation1 Airport, Northern

estimates of +0.04 and +0.02 inch for each curve, and G has zero bias. The largest overestimates for Q are +1.66 inches (old curve) and +1.64 inches (new curve) on December 9-10, 1980. The largest for Qm are +0.85 inch (old curve, March 22-23, 1981) and +0.82 inch (new curve, December 9-10, 1980). Largest for Qa are +0.31 inch (old curve) and +0.36 inch (new curve) both on March 4-5, 1981. Largest for Qam are +0.16 inch (old curve), and +0.18 inch (new curve) both on March 4-5, 1981. G has no bias larger than +0.06 inch in any of the 21 storms, an excellent record. These statistics show that the automated method has a built-in protection against bias.

Neither the old nor the new curve of cloud top temperature vs. precipitation shows decided superiority. The frequencies in Table 5-23 give a slight edge to the new curve. Tables 5-2 through 5-22 indicate that Q was improved in only 38 percent of the cases when the new curve replaced the old, and Qm in only 33 percent of the cases. On the other hand, Qa improved in 67 percent of the cases, and Qam improved in 71 percent of the cases. However, the composite scores in Table 5-1 show much larger mean errors for Q and Qm under the new curve than under the old, but very small improvements in Qa and Qam under the new curve. This tends to swing the verdict in favor of the old curve.

Since neither curve has demonstrated marked superiority when tested in 21 storms, it is fortunate that both curves are now integral parts of the computer program. The user may agopt either or both curves for each rainy day, at his discretion.

SECTION 6 - THE FUTURE

This report completes the research and development phase of the project. The automated technique is now ready for the operational phase for which it was designed. In presenting reliable precipitation estimates for every cell in Viginia in near real time on a daily on-going basis, the technique requires on the order of 125 to 150 daily gage readings by dependable, highly motivated observers distributed as uniformly as feasible across the state.

Appendix C lists the stations used in the various stages of the investigation. These include official weather stations which report daily over national teletype and facsimile circuits; NATS stations recruited by VPI&SU, also reporting daily; cooperative observers whose reports are difficult to obtain prior to publication two months or more after the fact; and a handful of stations no longer reporting. Observation time for all these stations is, of necessity, between 6 a.m. and 9 a.m. local time. For best results with the automated technique, the cooperative observers should either be induced to assume NATS status or be by-passed with nearby recruits. The cooperative observers are in general a dedicated breed, yet their reports are of little value to the program if delayed more than 24 hours past observation time.

The motivation of volunteer observers depends largely on the "human approach", on convincing the observer that his contribution is important, and maintaining that conviction by frequent feedback of positive results achieved by the system. The NATS observers, recruited mainly from the agricultural community, no doubt have a stake in the economic benefits of the program, but pride in having a worthwile impact on their neighbors' management problems and programs also looms large.

John F. Moses (Moses¹⁶) has computerized the most time-consuming and laborious aspects of the Scofield/Oliver scheme and developed an interactive man-machine technique. Tests of his model are very promising; particularly good scores were made in a heavy thunderstorm regime over a high-density network of rain gages in northern Illinois. This interactive tehnique is still used almost exclusively for heavy rain situations, but it is hoped that eventually it can be applied to weaker storms, as required by agricultural users.

Project AGRISTARS, funded by Congress to devise a comprehensive program to estimate precipitation on a world-wide, year-round basis, has been examining all existent methods to attain this end. The Applications Laboratory of NESS, Washington, D. C. is developing meteorological satellite derived products in support of AGRISTARS. The users of the automated technique might find it advantageous to maintain contact with the Applications Lab in order to benefit by its findings.

In order to exploit new breakthroughs, the software of the system described in this report is adaptable and open-ended. The hardware, unlike many systems designed for short-range research projects, has been provided by NASA for a permanent operation, and is generally of highest quality and durability.

APPENDIX A

COMPUTER PROGRAMS #1 & #2

COMPUTER PROGRAM #1

PERIOR RAINDS
C THIS IS THE MAIN DRIVER COUTTINE FOR THE SATELLITE PAINFALL
C FETTHATION PROGRAM COMMUTE RAINFALL FETTHATE FOR FACH HOUR
C FROM 1200 711 II THROUGH 1100 711 II THE NEXT DAY (24 HOURS).
C THE TOTAL DAYS ESTIMATE IS THE SUM OF EACH HOUSELY ESTIMATE.
I DGICAL #1 FIL VAH(15), ANS, IFIL NH(16)
LOGICAL 1 ISTA ISTAIN(8) NAME (24), ICA
INTEGER IROU. ICOL. ID
REAL STATULES
INTEGER NOGOOD, THRESH, [YR(2), [MO(2), [DAY(2), HOURS(24), [HR
SEAL TERR(120), CHRAIN(120), HEAIN(120), FILE(4)
DATA 7550/120#0.0/.THRESH/24/.FTLE/'.DY1'.':DAT'.'12. '.' 0'/
DATA HOURS/121/131/141/151/161/171/181/191
1 (201.1211.1221.1231.1001.1011.1021.1031.
\$ '04'.'05'.'06'.'07'.'08'.'09'.'10'.'11'/
FRUITUAL FNCF (STATN(1), ISTATN(1)), (ISTATN(1), ID), (ISTATN(3), ICA),
(ISTAIN(E).IROW).(ISTAIN(E).ICOL).(STAIN(13).NAME(1))
EDUTUAL FINCE (FILE(1), IETLAM(1)), (TETLAM(2), IHR).
t (FILNAM(1), IFILNM(2))
HRITE(S.*) STOTER YEAR MONTH, DAY OF FIRST 12 HOURS '.
(1202 711 1 TO 2300 711 11) AS YY, MH. DD.
SEAD(5, x) TYR(1), TMR(1), TDAY(1)
MRITE(5.1) FINTER YEAR MONTH DAY OF LAST 12 HOURS '.
2000 711 H TO 1100 711 H) AS YY, MH. DD
SEAD(5.#)[YR(2).[HG(2).[RAY(2)
ISTAR FALSE
HRITE(5.*)'ON YOU HANT HOURLY STATION ESTIMATES PSINTER (Y OR N)?'
SEAD (*.130) ANS
TECANS NE 14Y GO TO 30
ISTAR TRUE
HRITE(A.10) IYR(1). [HO(1). [DAY(1)
10 FORMATICIANTELY STATION ESTIMATES FOR DATE (.13. // .13. // .13.)
20 NBADEO
O S S Z I M M
78
C SET LHEATH TO SERO INITIALLY
HAITE (T. F) (SEGIN EXECUTION)
HRITE(5.1) ZERO FILLING LAST MOUR AND TOTAL PAIN FILES
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* RECORDSTELLO ASSOCIATEURE LABLE - LAU HE MAXEEC-42)
' OPEN(INITE: 0. NAMES: DYO:TRAIN. '. TYPES: OF D'. ACCESSS: DIRECT'.
L PERSONSITE LOG ASSOCIATION (ARE E-LAUTED MAYEE-142)
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i IAUI HR=1
DO 100 I=1,42
HRITE(A'TAULHR) ZERO
100 CONTINUE
DO 150 1-1-42
USITE (10 LAUTRA) ZERO
(50 CONTINUE
CLOSS (UNIT=4)
- C PERCETS ALL 24 HOURS OF DATA
C HOUR LOOP
20 1000 N=1-24
IF/N.MF. 13, 160, 70, 200
HRITE(S.*)/REPLACE DATA DISK HITH 00007 TO 11007 DISK/
MRITE(S. 1) TYPE RETURN MHEN READY TO CONTINUE!
READ(5.180) ANS
120 FORMAY (2001)
1102
200 DECORE (2.205.HOURS (N.) THOUR
205 FORMAT(12)
THE-HOURS (N)
IF (ISTA) WRITE (6.201) IMP
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THE COLUMN TO STRATE (AND THE COLUMN TO STRATE ()
HRITE(E. E.)

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URITE(5.4) PROCESS NEXT HOUR OF DATA'
- 220 FORMAT(1X. FILE MANE THIS HOUR (.10A1)
OPEN(UNIT-2, NAME-FILMAN, TYPE-(OLD/)
OFEN(UNIT-J.NAME*/DYO!CHSAT.'.TYPE-'OLD'.ACCESS-'DIRECT'.
* RECORDELIE-JO-ASSOCIATEUARIABLE-IAUSAT-MAXREC-42>
ICHDAT-ILUN(2)
IUSAT-1
CALL PREPRO(IYR(II)+IHO(II)+IHOUR+ IGHDAT, IUGAT, IAVGAT, NGGGCD)
CLOSE(UNIT-3)
WRITE(5.*) 'PREPRO COMPLETED'
IF (NOGOGO - EO - O) GO TO 300
C BAD HOUR/HISSING DATA
INTERPREDICTION OF BATAL
MRADHMRADAI
1
CLOSS CHATT-TA
IF (NBAD.LT.THRESH) GO TO LOOD WRITE(5,*) *TOO HANY HOURS HISSING / DAD / THRESH EXCEEDED /
WRITE(5,*)'TOO HANY HOURS HISSING/DAD, THRESH EXCEEDED'
00 TO 1500
C GOOD DATA SET
C
300 OPEN(UNITEA, NAME = 'DYO! HRAIN.'. TYPE = 'O! D'. ACCESS = 'DIRECT'.
PECORDSITE-130-ASSOCIATEVARIABLE-LAVLHR.MAXEEC-42)
OPEN(UNIT-S, NAME-'DYO:CHRAIN / TYPE-'DLD', ACCESS-'DIRECT'
* RECORDSIZE +120 ASSOCIATEVARIABLE = LAURAL MAXREC =42)
TURATER
CALL GUICK(IUSAT, IURAI, IAUSAT, IAURAI)
CLOSE(UNIT=3)
WRITE(5.*) COULCK COMPLETED
G
C STORE HOURLY STATION WALLES FOR PRINTING IF DESIRED
C
IF(.NG(.ISTA)GO TO 390
* SECORDSIZE=18.ASSOCIATEVARIABLE=1AUSTA.HAXREC=200)
DO 380 I=1,200
SEAD(ISTAEL / I)STAIN
IF(ID.17.0)60 ID 390
IF(IROW.GT.MXROW.OR.IROW.L.J.MNROW)GO TO 380
IF(ICOL.GT.MXCOL.OR.ICOL.LT.MNCOL)GO TO 380
SEAR (IURAL'IROW) CHRAIN
WRITE(6,310) ID, ICA, IROW, ICDL, CHRAIN(ICDL), NAME 310 FORMAT(1X, IZ, 3X, II, 3X, IZ, 2X, IZ, 3X, FA, 2, 5X, 24A1)
330 CONTINUE
CLOSE (UNIT=12)
C
C ANY MISSING HOURS?
ISO INTERENO
IF(NMISS.EG.O)GO TO 600 OPEN(UNIT=11.NAMF='DYO:INTERP.'.TYPF='OLD'.ACCESS='DIRECT'.
* RECORDSIZE 120.ASSOCIATEURSIANI F= LAUINI . MAYREC = 42)
TITAT-1!
INTERPAL
G
C CORY CHRAIN HEADER TO INTERP FILE
READ(IULHR'1)) HRAIN
" WRITE(ININT(1)CHRAIN
19
C MISSING DATA, HOW MANY?
- ALSSIN'S VALA. HOU MANY?
HRITE(S. NHIGS. / HOURS MISSING DATA/
IF (NM ISS NE. 2) GO TO 500
C 2 HOURS HISSING, INTERPOLATE
' C
1 DO 450 K=2.42
READ(IURAI'K)CHRAIN
READ(IIILHR'K)LHRAIN
DO 400 I=1-112
CHRAIN(I)=LHRAIN(I)+2-O*CHRAIN(I)
400 CONTINUE

WELTE CHINT (X) CHEATH
150 CONTINUE
URITE(5-4) (INTERPOLATION COMPLETED)
CLOSEUMITARY
C NOT 2 MISSING OR GREATER THAN 2 HISSING SEMI-INTERFOLATE
- AUT 3 ALBERTON DA GALATER INAM 2 ALISEMMISENTALITATERATURATE
500 DC 580 X-3.45
PEAD (TURAL 'X) CHRAIN
SEADCELL HRYX HRAIN
00 550 [2].118
CHRAIN(T) NO. SEL HEAIN(T) - TECHEAIN(T)
ETO CONTINUE
URITE / ININT / K \ CHRAIN
SEC CONTINUE
URITE(S. K) (INTERPOLATION COMPLETED)
CLOSE (UNITED)
O GUN RAIN FOR THIS HOUR INTO TOTAL FOR DAY
400 CLOSE (UNIT-4)
OFEN UNITALA NAME - DYOLTRAIN TYPE - OLD . ACCESS - DIRECT .
- RECORDOIZE-130-AGGOCIATEVARIABLE-(AUTRA-MAXREC-42)
OPEN.CUNIT-9.NAHE-COVO.TEMERA IMPE-COLD. ACCISS-CDIRECT.
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- SO CALL RAINEN (JURA) - JUTRA - JARAL - JAUTEN - JAUTEN - JAUTEN -
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- OFEN-UNIT-G.NAME - DYSIGHRAIN. TYPE - OLD - AGGESS - DIRECT
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C SUBJECT OF HOUR LOOP C PROCESSING COMPLETED FOR ALL HOURS, CHECK FOR HISSING LAST HOUR IF (NMISS.FD.0)GO TO 1500 C SEMI-INTERPOLATE FOR MISSING FINAL HOURS C OPEN (UNIT=4.NAME='DYO:LHKAIN,', TYPE='OLD', ACCESS='DIRECT', 1, SECONDSIZE=100.ASSOCIATEUARIAN, FINAL HAYREC=AC)
C SUBJECT OF HOUR LOOP C PROCESSING COMPLETED FOR ALL HOURS, CHECK FOR MISSING LAST HOUR IF (NMISS.FD.0)GO TO 1500 C SEMI-INTERPOLATE FOR MISSING FINAL HOURS C OPEN (UNIT=4.NAME='DYO:LHRAIN.', TYPE='OLO', ACCESS='DIRECT', COPEN (UNIT=10.NAME='DYO:TRAIN.', TYPE='OLO', ACCESS='DIRECT', OPEN (UNIT=10.NAME='DYO:TRAIN.', TYPE='OLO', ACCESS='DIRECT',
C SUBJECT OF HOUR LOOP C SEMI-INTERPOLATE FOR ALL HOURS, CHECK FOR MISSING LAST HOUR C SEMI-INTERPOLATE FOR MISSING FINAL HOURS C SECONOSIZE CO. ASSOCIATEMANN.', TYPE COLO', ACCESSE' DIRECT', CREMINITE LO. MAME CATALON TYPE COLO C', ACCESSE' DIRECT', 1 SECONOSIZE CO. ASSOCIATEMANN. TYPE COLO C', ACCESSE' DIRECT'. 1 SECONOSIZE CO. ASSOCIATEMANN. TYPE COLO C', ACCESSE' DIRECT'.
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C FND OF HOUR LOOP C PROCESSING COMPLETED FOR ALL HOURS, CHECK FOR MISSING LAST HOUR IF (NMISS.FD.O) GO ID 1500 C SEMI-INTERPOLATE FOR MISSING FINAL HOURS C OPEN (UNIT=4.MAME='DYO:LHRAIN.', TYPE='OLD', ACCESS='DIRECT', PROCESSIVE=120.ASSOCIATEVARIABLE=LAULHE.HAYREF=12) OREN (UNIT=120.ASSOCIATEVARIABLE=LAUTRA.HAXREF=12) OREN (UNIT=120.ASSOCIATEVARIABLE=LAUTRA.HAXREF=12) INTER=10
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C FND OF HOUR LOOP C PROCESSING COMPLETED FOR ALL HOURS, CHECK FOR MISSING LAST HOUR IF (NHISS.FD.O) GO IN 1500 C SEMI-INTERPOLATE FOR MISSING FINAL HOURS OPEN (UNIT-4.NAME='DYO:LHKAIN.', TYPE='OLD', ACCESS='DIRECT', ' PETOROSITE-120.ASSOCIATEUARIAN', TYPE='OLD', ACCESS='DIRECT', OPEN (UNIT-10.NAME='DYO:LHKAIN.', TYPE='OLD', ACCESS='DIRECT', ' PETOROSITE-120.ASSOCIATEUARIANLE-1AULHR.MAYREC-42) ORFM (UNIT-11.NAME='DYO:INTERP.', TYPE='OLD', ACCESS='DIRECT', ' RECORDSITE-120.ASSOCIATEUARIANLE-1AULHT.MAYREC-42) INIT-11 INIT-11 INIT-11 INIT-11
C FND OF HOUR LOOP C FND OF HOUR LOOP C PROCESSING COMPLETED FOR ALL HOURS, CHECK FOR MISSING LAST HOUR IF (NMISS.FD.O) GO TO LEGO C SEMI-INTERPOLATE FOR MISSING FINAL HOURS C OPEN (UNIT=4.NAME='OYO:LHRAIN.', TYPE='OLO', ACCESS='DIRECT', I PROCEDSIZE=100.ASSOCIATEVARIAR F.LAULHE.HAYREF==2) OREM (UNIT=10.NAME='OYO:LRAIN.', TYPE='OLO', ACCESS='DIRECT', I SECORDSIZE=100.ASSOCIATEVARIAR F.LAULHE.HAYREF==2) OREM (UNIT=11.NAME='DYO:LNTERP.', TYPE='OLO', ACCESS='DIRECT', I RECORDSIZE=100.ASSOCIATEVARIAR F.LAULHT.HAYREF==2) IULHT=11 IULT==10 THU HR=4
C END OF HOUR LOOP C PROCESSING COMPLETED FOR ALL HOURS, CHECK FOR MISSING LAST HOUR IF (NHISS.FO.0) GO TO 1500 C SEMI-INTERPOLATE FOR MISSING FINAL HOURS OPEN (UNIT-4.NAME='DYO:LHKAIN.', TYPE='OLO', ACCESS='DIRECT', ' PECORDSITE-120.ASSOCIATEVARIABLE-1AULHE-MAYSEC-42') ORFM (UNIT-10.NAME='DYO:LTRAIN.', TYPE='OLO', ACCESS='DIRECT', ' SECORDSITE-120.ASSOCIATEVARIABLE-1AULHE-MAYSEC-42') ORFM (UNIT-11.NAME='DYO:LNTERP.', TYPE='OLO', ACCESS='DIRECT', ' RECORDSITE-120.ASSOCIATEVARIABLE-1AULHE-MAYSEC-42') IUINT=11 IUITA=10 IUIHR=4
C FND OF HOUR LOOP C FND OF HOUR LOOP C PROCESSING COMPLETED FOR ALL HOURS, CHECK FOR MISSING LAST HOUR C PROCESSING COMPLETED FOR ALL HOURS, CHECK FOR MISSING LAST HOUR C F(MMISS.FD.0)GD ID 1500 C SEMI-INTERPOLATE FOR MISSING FINAL HOURS C OPEN(UNIT=4.MAME='DYO!LHKAIN.', TYPE='GLO', ACCESS='DIRECT', 1 PERCOROSIZE=100.ASSOCIATEVARIABLE FLAULHE HAYREFTALD) C PEN(UNIT=10.MAME='DYO!INTERP.', TYPE='GLO', ACCESS='DIRECT', 1 PECCOROSIZE=100.ASSOCIATEVARIABLE FLAUTHE MARREFTALD' C PEN(UNIT=1) IUITA=10 IUITA=10 IUITA=10 C COPY TRAIN HEADER TO INTERP
C SND OF HOUR LOOP C STORESSING COMPLETED FOR ALL HOURS, CHECK FOR MISSING LAST HOUR C PROCESSING COMPLETED FOR ALL HOURS, CHECK FOR MISSING LAST HOUR C SEMI-INTERPOLATE FOR MISSING FINAL HOURS C OPEN(UNIT=4.NAME='DYO:LHKAIN.', TYPE='OLD', ACCESS='DIRECT', 1 PROCESSITE=100.ASSOCIATEMENTARIE=IAULHE.MAYSEF==20) C COPY INALL NAME='DYO:INTERP.', TYPE='OLD', ACCESS='DIRECT', 1 PROCESSITE=100.ASSOCIATEMENTARIE=IAULHE.MAYSEF==20) C COPY INALL THE PROCESSION OF THE PROCESS OF THE P
C TWO OF HOUR LOOP C TWO OF HOUR LOOP C PROCESSING COMPLETED FOR ALL HOURS, CHECK FOR HISSING LAST HOUR C IF (NMISS.FO.Q)GO TO LEGO C SEMI-INTERPOLATE FOR MISSING FINAL HOURS C OPEN.(UNIT=4.NAME='DYO:LHRAIN.', TYPE='OLD', ACCESS='DIRECT', 1. PETOROSIZE=120.ASSOCIATEVARIABLE=1AUTRA.MAREC=4C') OREN.(UNIT=1.NAME='DYO:TNTERD.', TYPE='OLD', ACCESS='DIRECT', 1. SETOROSIZE=120.ASSOCIATEVARIABLE=1AUTRA.MAREC=4C') OREN.(UNIT=1.1.NAME='DYO:TNTERD.', TYPE='OLD', ACCESS='DIRECT', 1. PETOROSIZE=120.ASSOCIATEVARIABLE=1AUTRA.MAXREC=4C') IUINT=11 IUITAA=10 IUI HR=4 C COPY IRAIN MEADER TO INTERP C SEAD(IULHR'I)LHRAIN SEAD(IULHR'I)LHRAIN
C FND OF HOUR LOOP C STOCKSTING COMPLETED FOR ALL HOURS, CHECK FOR HISSING LAST HOUR C SCHI-INTERPOLATE FOR HISSING FINAL HOURS C SCHI-INTERPOLATE FOR HISSING FINAL HOURS C OPEN (UNIT=4.NAME='NYO:LHKAIN.', TYPE='OLO', ACCESS='DIRECT', 1 SCHOODS:FF=100.ASSOCIATEVARIAN.', TYPE='OLO', ACCESS='DIRECT', 1 RECORDS:FF=100.ASSOCIATEVARIAN.', TYPE='OLO', ACCESS='DIRECT', 1 RECORDS:FF=100.ASSOCIATEVARIAN.F=1AUTRA.HAXEC=42') OPEN (UNIT=1).NAME='NYO:INTERP '. TYPE='OLO', ACCESS='DIRECT', 1 RECORDS:FF=100.ASSOCIATEVARIAN.F=1AUTRA.HAXEC=42') THINT=11 C COPY TRAIN HEADES TO INTERP C SEAD(INLHR'I) HEADIN SEAD(INLHR'I) HEADIN JETTE (UNITA'I) CHEAIN
C FND OF HOUR LOOP C FND OF HOUR LOOP C PROCESSING COMPLETED FOR ALL HOURS, CHECK FOR HISSING LAST HOUR C PROCESSING COMPLETED FOR ALL HOURS, CHECK FOR HISSING LAST HOUR C PENCINTERPOLATE FOR MISSING FINAL HOURS C OPEN(UNIT=4.NAME='DYO!LHKAIN.', TYPE='OLD', ACCESS='DIRECT', C PENCINTIT=100.ASSOCIATEMARIAN.E FLAWING.HAYSEFT=10) OREN(UNIT=100.ASSOCIATEMARIAN.E.FLAWING.HAYSEFT=10) C PENCINTIT=1100.ASSOCIATEMARIAN.E.FLAWING.HAYSEFT=10) INTER=10 INTER=10 INTER=10 C COPY TRAIN HEADER ID INTERP SEAD(IULHR'1)) HRAIN EFAD(IUTRA') CHRAIN
C FUR OF HOUR LOOP C SEND OF HOUR LOOP C SEND INTERPOLATE FOR ALL HOURS, CHECK FOR HISSING LAST HOUR C SEND-INTERPOLATE FOR HISSING SINAL HOURS C SEND-INTERPOLATION ASSOCIATION FOR INTERPOLATION OF MORE AND ASSOCIATION FOR AND ASSOCIATION OF SENDENCE OF

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	C 01	S ROUTINE STRIPS RAW DATA DOWN TO MIN SIZE: FILLS IN FOR
	C 514	S ROUTINE STRIPS RAW DATA DOWN TO MIN SIZE: FIVES IN FOR SING RECORDS: FLAGS FOR MISSING HOURLY DATA SETT IF MECESSARY FUT IS SMALLEST USEABLE DATA SEY WHICH STILL COVERS ENTIRE ATE AREA (WITH LEAST AMOUNT OF EXTRA SEACE). FOR IR. 120
	C 214	S ROUTINE STRIPS RAW DATA DOWN TO MIN SIZE, FIU.6 IN FOR SIZE PROPERTY. FIND RECORDS, FLAGS FOR MISSING HOURLY DATA SETS IF MECESSARY. FUT IS SMALLEST USEABLE DATA SET WHICH STILL COVERS ENTIRE MEACHERS PER SECORD, TOTAL OF 42 RECORDS WITH A HEADER RECORD.
	C 0F	SECUTINE STRIPS RAW DATA DOWN TO MIN SIZE: FIU.5 IN FOR SIMO RECORDS: FLAGS FOR MISSING HOURLY DATA SETS IF MECESSARY FUT IS SMALLEST USEABLE DATA SET WHICH STILL COVERS ENTIRE MATE AREA (MITH LEAST AMOUNT OF SYTRA SEACE). FOR IR. 120 REACTERS FOR SECORD. TOTAL OF 42 RECORDS WITH A HEADER RECORD. 120 CHARACTERS CONTAINING DATE, TIME, FILE WAME, MISSING DATA
	C 0F	S ROUTINE STRIPS RAW DATA DOWN TO MIN SIZE, FIU.6 IN FOR SIZE PROPERTY. FIND RECORDS, FLAGS FOR MISSING HOURLY DATA SETS IF MECESSARY. FUT IS SMALLEST USEABLE DATA SET WHICH STILL COVERS ENTIRE MEACHERS PER SECORD, TOTAL OF 42 RECORDS WITH A HEADER RECORD.
	C 514 C 514 C 514 C 514 C 516 C 516	SECUTINE STRIPS RAW DATA DOWN TO MIN SIZE: FIU.5 IN FOR SIMO RECORDS: FLAGS FOR MISSING HOURLY DATA SETS IF MECESSARY FUT IS SMALLEST USEABLE DATA SET WHICH STILL COVERS ENTIRE MATE AREA (MITH LEAST AMOUNT OF SYTRA SEACE). FOR IR. 120 REACTERS FOR SECORD. TOTAL OF 42 RECORDS WITH A HEADER RECORD. 120 CHARACTERS CONTAINING DATE, TIME, FILE WAME, MISSING DATA
	C THI C WISC C OUT C STA C CHA	S SCUTINE STRIPS RAW DATA DOWN TO MIN SIZE: FILLS IN FOR SING RECORDS: FLAGS FOR MISSING HOURLY DATA SETS IF MECESSARY FILL COVERS ENTIRE AREA (MITH LEAST AMOUNT OF SYTRA SEACE). FOR IR, 120 DEACTERS PER SECORD. TOTAL OF 42 RECORDS WITH A HEADER SECORD LOO CHARACTERS CONTAINING DATE, TIME, FILE NAME, MISSING DATA FLAG, RAD DATA FLAG, ETC. NOGODD SET TO 1 WHEN DATA SET RAD
	C THI C WISC C OUT C STA C CHA	S COUTINE STRIPS RAW DATA DOWN TO MIN SIZE, FILLS IN FOR SIMO RECORDS, FLAGE FOR MISSING HOURLY DATA SETS IF MECESSARY FEUT IS SMALLEST USEABLE DATA SEY WHICH STILL COVERS ENTIRE MECASA (MITH LEAST AMOUNT OF EXTRA SEACE), FOR IS, 120 DEACTERS PER SECORD, TOTAL OF 42 RECORDS WITH A HEADER SECORD 120 CHARACTERS CONTAINING DATE, TIME, FILE NAME, MISSING DATA FLAG, EDG. NOGOOD SET TO 1 WHEN DATA SET RAD MOTE: CURRENTLY PROCESSING ONLY IN DATA.
	C THI C WISC C OUT C STA C CHA	S SCUTINE STRIPS RAW DATA DOWN TO MIN SIZE: FILLS IN FOR SING RECORDS: FLAGS FOR MISSING HOURLY DATA SETS IF MECESSARY FILL COVERS ENTIRE AREA (MITH LEAST AMOUNT OF SYTRA SEACE). FOR IR, 120 DEACTERS PER SECORD. TOTAL OF 42 RECORDS WITH A HEADER SECORD LOO CHARACTERS CONTAINING DATE, TIME, FILE NAME, MISSING DATA FLAG, RAD DATA FLAG, ETC. NOGODD SET TO 1 WHEN DATA SET RAD
	C THI C WISC C OUT C STA C CHA	SECUTINE STRIPS RAW DATA DOWN TO MIN SIZE, FIU.6 IN FOR SIMO RECORDS, FLAGS FOR MISSING HOURLY DATA SETS IF MECESSARY FULT IS SMALLEST USEABLE DATA SET WHICH STILL COVERS ENTIRE MEACTERS PER SECORD, TOTAL OF 42 RECORDS WITH A HEADER RECORD 120 CHARACTERS CONTAINING DATE, TIME, FILE NAME, MISSING DATA FLAG, RAD DATA FLAG, FIC. NOCODD SET TO 1 WHEN DATA SET RAD MEACTERS PER SECORDS WITH A HEADER RECORD 120 CHARACTERS CONTAINING DATE, TIME, FILE NAME, MISSING DATA FLAG, RAD DATA FLAG, FIC. NOCODD SET TO 1 WHEN DATA SET RAD MEACTERS PER SECORDS WITH A HEADER RECORD
	C THI C WISC C OUT C STA C CHA	SECUTINE STRIPS RAW DATA DOWN TO MIN SIZE: FIU.6 IN FOR SIMO RECORDS: FLAGS FOR MISSING HOURLY DATA SETS IF MECESSARY FULT IS SHALLEST USEABLE DATA SEY HMICH STILL COVERS ENTIRE MATE AREA (MITH LEAST AMOUNT OF SYTRA SEACE). FOR 18, 120 BRACTERS PER SECORD, TOTAL OF 42 RECORDS WITH A HEADER RECORD 120 CHARACTERS CONTAINING DATE, TIME, FILE NAME, MISSING DATA FLAG, BAD DATA FLAG, FIC. NOGODD SET TO 1 WHEN DATA SET BAD MOTE: CURRENTLY PROCESSING ONLY IK DATA. 128***********************************
	C THI C WISC C OUT C STA C CHA	SECUTINE STRIPS RAW DATA DOWN TO MIN SIZE: FILLS IN FOR SING RECORDS. FLAGS FOR MISSING HOURLY DATA SETS IF MECESSARY FUT IS SMALLEST USEABLE DATA SET WHICH STILL COVERS ENTIRE AFE AREA (MITH LEAST AMOUNT OF SYTRA SEACE). FOR IR. 120 ARACTERS PER SECORD. TOTAL OF 42 RECORDS WITH A HEADER SECORD 120 CHARACTERS CONTAINING DATE, TIME, FILE NAME, MISSING DATA FLAG, RAD DATA FLAG, FIC. NOGOOD SET TO 1 WHEN DATA SET RAD MOTE: CURRENTLY PROCESSING ONLY IN DATA. MEMBERSHERSHERSHERSHERSHERSHERS LOGICAL*1 FIRST, ITEMP(120), ITEST LOGICAL*1 IREC(120), HEADER(120), DATIME(4), YYMM(4), KEY(12) LOGICAL*1 CUREC(131), LAREC(120), IRAD, EMPTY, NAME(5), NAME(2)
	C THI C WISC C OUT C STA C CHA	SECUTINE STRIPS RAW DATA DOWN TO MIN SIZE: FILLS IN FOR SING RECORDS. FLAGS FOR MISSING HOURLY DATA SETS IF MECESSARY FUT IS SMALLEST USEABLE DATA SET WHICH STILL COVERS ENTIRE AFE AREA (MITH LEAST AMOUNT OF SYTRA SEACE). FOR IR. 120 ARACTERS PER SECORD. TOTAL OF 42 RECORDS WITH A HEADER SECORD 120 CHARACTERS CONTAINING DATE, TIME, FILE NAME, MISSING DATA FLAG, RAD DATA FLAG, FIC. NOGOOD SET TO 1 WHEN DATA SET RAD MOTE: CURRENTLY PROCESSING ONLY IN DATA. MEMBERSHERSHERSHERSHERSHERSHERS LOGICAL*1 FIRST, ITEMP(120), ITEST LOGICAL*1 IREC(120), HEADER(120), DATIME(4), YYMM(4), KEY(12) LOGICAL*1 CUREC(131), LAREC(120), IRAD, EMPTY, NAME(5), NAME(2)
	C THI C WISC C OUT C STA C CHA	COUTINE STRIPS RAW DATA DOWN TO MIN SIZE: FILLS IN FOR SIME RECORDS. FLAGS FOR MISSING HOURLY DATA SETS IF MECESSARY FUT IS SMALLEST USEABLE DATA SET WHICH STILL COVERS ENTIRE AREA (MITH LEAST AMOUNT OF SYTRA SEACE). FOR IR. 120 REACTERS PER SECORD. TOTAL OF 42 RECORDS WITH A HEADER RECORD 120 CHARACTERS CONTAINING DATE, TIME, FILE NAME, MISSING DATA FLAG, RAD DATA FLAG, FTC. NOGOOD SET TO 1 WHEN DATA SET RAD MOTE: CURRENTLY PROCESSING ONLY IN DATA. WHEN MAKENER WHEN WARREN WARREN WARREN LOGICAL WITH FIRST, LIEMP(120), LIEST LOGICAL WITH LESC(120), HEADER(120), DATIME(4), YYMM(4), KEY(12) LOGICAL WITH LESC(131); LAREC(120), IBAD, EMPTY, NAME(5), NAME4(2) INTEGER IROW, LROW, IBLK, NREC, NCHRS, THRESH, BAD
	C THI C WISC C OUT C STA C CHA	SECUTINE STRIPS RAW DATA DOWN TO MIN SIZE. FILLS IN FOR SING RECORDS, FLAGE FOR MISSING HOURLY DATA SETS IF MECESSARY FELT IS SMALLEST USEABLE DATA SEY WHICH STILL COVERS ENTIRE MECHES PER SECORD. TOTAL OF 42 RECORDS WITH A HEADER RECORD 120 CHARACTERS CONTAINING DATE, TIME.FILE NAME.MISSING DATA FILE, CURRENTLY PROCESSING ONLY IN DATA. FLAG. RAD DATA FLAG.FIC. NOGOOD SET TO 1 WHEN DATA SET RAD DOTE: CURRENTLY PROCESSING ONLY IN DATA. MAXMAXMAMMAMMAMMAMMAMMAMMAMMAMMAMMAMMAMM
	C THI C WISC C OUT C STA C CHA	FOUTURE STRIPS RAW DATA DOWN TO MIN SIZE, FILLS IN FOR SING RECORDS, FLAGE FOR MISSING HOURLY DATA SET IF MECESSARY FEUT IS SMALLEST USEABLE DATA SET WHICH STILL COVERS ENTIRE MEACTERS PER SECORD, TOTAL OF 42 RECORDS WITH A HEADER RECORD 120 CHARACTERS CONTAINING DATE, TIME, FILE NAME, MISSING DATA FLAG, BAD DATA FLAG, FIC. NOGOOD SET TO 1 WHEN DATA SET BAD MOTE: CURRENTLY PROCESSING ONLY IN DATA. MEXICAL MISSING TO 1 WITH A HEADER BAD MISSING MALEST MA
	C THI C WISC C OUT C STA C CHA	FOUTURE STRIPS RAW DATA DOWN TO MIN SIZE, FILLS IN FOR SING RECORDS, FLAGE FOR MISSING HOURLY DATA SET IF MECESSARY FEUT IS SMALLEST USEABLE DATA SET WHICH STILL COVERS ENTIRE MEACTERS PER SECORD, TOTAL OF 42 RECORDS WITH A HEADER RECORD 120 CHARACTERS CONTAINING DATE, TIME, FILE NAME, MISSING DATA FLAG, BAD DATA FLAG, FIC. NOGOOD SET TO 1 WHEN DATA SET BAD MOTE: CURRENTLY PROCESSING ONLY IN DATA. MEXICAL MISSING TO 1 WITH A HEADER BAD MISSING MALEST MA
	C THI C WISC C OUT C STA C CHA	COUTINE STRIPS RAW DATA DOWN TO MIN SIZE, FIU.6 IN FOR SIMO RECORDS, FLAGS FOR MISSING HOURLY DATA SETS IF MECHSSARY FULT IS SMALLEST USEABLE DATA SET WHICH STILL COUPERS ENTIRE MEACTERS PER SECORD, TOTAL OF 42 RECORDS WITH A HEADER RECORD 120 CHARACTERS CONTAINING DATE, TIME, FILE NAME, MISSING DATA FLAG, BAD DATA FLAG, ETC. NOCODD SET TO 1 WHEN DATA SET BAD MOTE: CURRENTLY PROCESSING ONLY IN DATA. MEXICAL MISSING MISSING DATA LOGICAL TIRST, ITEMP(120), ITEST LOGICAL TIRST, ITEMP(120), ITEST LOGICAL TIRST, ITEMP(120), IRAD, EMPTY, NAME(5), NAME(2) INTEGER IROW, IRLN, NREC, NCHRS, THRESH, BAD SEAL MA RKEY(T) FOULUALENCE (RKEY(T), KEY(T)), (CURREC(T), DATIME(4)), DATIME(1))
	C THI C WISC C OUT C STA C CHA	COUTINE STRIPS RAW DATA DOWN TO MIN SIZE, FILLS IN FOR SIMO RECORDS, FLAGS FOR MISSING HOURLY DATA SETS IF MECESSARY FILT IS SHALLEST USEABLE DATA SEY HMICH STILL COUPERS ENTIRE ATE AREA (MITH LEAST AMOUNT OF SYTRA SEACE). FOR 1E, 170 BRACTERS PER SECORD, TOTAL OF 42 RECORDS WITH A HEADER RECORD 120 CHARACTERS CONTAINING DATE, TIME, FILE NAME, MISSING DATA FLAG, BAD DATA FLAG, FIC. NGGOOD SET TO 1 WHEN DATA SET BAD MOTE: CURRENTLY PROCESSING ONLY IK DATA. EXHAUXIMATERIAN SHARKEN SHARKEN LOGICAL 1 FIRST, ITEMP(120), ITEST LOGICAL 1 FIRST, ITEMP(120), DATIME(4), YYMM(4), KEY(12) LOGICAL 1 CUREC(131), LAREC(120), BAD, EMPTY, NAME(5), NAME4(2) INTEGER IROW, LROW, IRLK, NREC, NCHRS, THRESH, BAD GEAL 4 REFY(1) FOUTUAL ENCE (HEADER(1), YYMM(1)), (HEADER(5), DATIME(1)) FOUTUAL ENCE (HEADER(9), NAME(1)), (HEADER(114), FMSTY)
	C THI C WISC C OUT C STA C CHA	COUTINE STRIPS RAW DATA DOWN TO MIN SIZE. FIU.S IN FOR SIMO RECORDS. FLAGS FOR MISSING HOURLY DATA SETS IF MECESSARY FUT IS SHALLEST USEABLE DATA SET WHICH STILL COVERS ENTIRE MATE AREA (MITH LEAST AMOUNT OF SYTRA SEACE). FOR IR. 120 REACTERS PER SECORD. TOTAL OF 42 RECORDS WITH A HEADER RECORD 120 CHARACTERS CONTAINING DATE, TIME, FILE NAME, MISSING DATA FLAG, RAD DATA FLAG, FTC. NOGOOD SET TO 1 WHEN DATA SET BAD MOTE: CURRENTLY PROCESSING ONLY IR DATA. EXHAMMARIZED HARMARIAN HARMARIAN LOGICAL TIPEST, ITEMP(120), ITEST LOGICAL TIPEST, ITEMP(120), HEADER(120), DATIME(4), YYMM(4), KEY(12) LOGICAL CUREC(131), LAREC(120), IRAD, EMPTY, NAME(5), NAME4(2) INTEGER IROW, LROW, IRLN, NREC, NCHRS, THRESH, BAD SEAL A REY(T) FOUTUAL FORCE (REY(1), KEY(1)), (CUREC(1), IREC(1)) FOUTUAL FORCE (HEADER(13), NAME(1)), (HEADER(13), DATIME(1)) FOUTUAL FORCE (HEADER(15), IRAD), (NAME(4), NAME4(1))
	C THI C WISC C OUT C STA C CHA	ES ROUTINE STRIPS RAW DATA DOWN TO MIN SIZE, FILLS IN FOR SING RECORDS, FLAGE FOR MISSING HOURLY DATA SET IF MECESSARY FEUT IS SMALLEST USEABLE DATA SEY WHICH STILL COVERS ENTIRE MEACTERS PER SECORD, TOTAL OF 42 RECORDS WITH A HEADER RECORD 120 CHARACTERS CONTAINING DATE, TIME, FILE NAME, MISSING DATA FLAG, RAD DATA FLAG, FIC. NOGOOD SET TO 1 WHEN DATA SET RAD MOTE: CURRENTLY PROCESSING ONLY IN DATA. LOGICAL*: FIRST, ITEMP(120), ITEST LOGICAL*: FIRST, ITEMP(120), DATIME(4), YYMM(4), KEY(12) LOGICAL*: CUREC(13), LAREC(120), DATIME(4), YYMM(4), KEY(12) LOGICAL*: FROW, LROW, IBLN, NREC, NCHRS, THRESH, BAD SEAL** RKEY(T) FOUTUAL FNCE (RKEY(T), KEY(T)), (CUREC(T), IREC(T)) FOUTUAL FNCE (HEADER(9), NAME(T)), (HEADER(1A), PMPTY) FOUTUAL FNCE (HEADER(1S), IBAD), (NAME(A), NAME(A)), NAME(A(T)) DATA RKEY(Y) NSMA'.'O1 K', WBC.'/
	C THI C WISC C OUT C STA C CHA	ES ROUTINE STRIPS RAW DATA DOWN TO MIN SIZE, FILLS IN FOR SING RECORDS, FLAGE FOR MISSING HOURLY DATA SET IF MECESSARY FEUT IS SMALLEST USEABLE DATA SEY WHICH STILL COVERS ENTIRE MEACTERS PER SECORD, TOTAL OF 42 RECORDS WITH A HEADER RECORD 120 CHARACTERS CONTAINING DATE, TIME, FILE NAME, MISSING DATA FLAG, RAD DATA FLAG, FIC. NOGOOD SET TO 1 WHEN DATA SET RAD MOTE: CURRENTLY PROCESSING ONLY IN DATA. LOGICAL*: FIRST, ITEMP(120), ITEST LOGICAL*: FIRST, ITEMP(120), DATIME(4), YYMM(4), KEY(12) LOGICAL*: CUREC(13), LAREC(120), DATIME(4), YYMM(4), KEY(12) LOGICAL*: FROW, LROW, IBLN, NREC, NCHRS, THRESH, BAD SEAL** RKEY(T) FOUTUAL FNCE (RKEY(T), KEY(T)), (CUREC(T), IREC(T)) FOUTUAL FNCE (HEADER(9), NAME(T)), (HEADER(1A), PMPTY) FOUTUAL FNCE (HEADER(1S), IBAD), (NAME(A), NAME(A)), NAME(A(T)) DATA RKEY(Y) NSMA'.'O1 K', WBC.'/
	C THI C WISC C OUT C STA C CHA	SECUTINE STRIPS RAW DATA DOWN TO MIN SIZE. FILLS IN FOR SING RECORDS. FLAGE FOR MISSING HOURLY DATA SET? IF MECESSARY FEUT IS SMALLEST USEABLE DATA SEY WHICH STILL COVERS ENTIRE MEACTERS PER SECORD. TOTAL OF 42 RECORDS WITH A HEADER RECORD 120 CHARACTERS CONTAINING DATE, TIME.FILE NAME.MISSING DATA FLAG.RAD DATA FLAG.FIC. NOGOOD SET TO 1 WHEN DATA SET RAD MOTE: CURRENTLY PROCESSING ONLY IN DATA. LOGICAL*1 FIRST, ITEMP(120), ITEST LOGICAL*1 FIRST, ITEMP(120), ITEST LOGICAL*1 GUREC(120), HEADER(120), DATIME(4), YYMM(4), KEY(12) LOGICAL*1 GUREC(131), LAREC(120), IRAD.EMPTY, NAME(S), NAME4(2) INTEGER IROW.LROW, IRLN, NREC, NCHRS, THRESH, BAD SEAL*A RKEY(T) FOUTUAL FNCE (HEADER(1), YYMM(1)), (HEADER(S), DATIME(1)) FOUTUAL FNCE (HEADER(1), NAME(1)), (HEADER(1A), FMPTY) FOUTUAL FNCE (HEADER(1), NAME(1)), (HEADER(1A), FMPTY) DATA NAME('D'.'A'.'O'I K', 'WRC '/ DATA NAME('D'.'A'.'O'I K', 'WRC '/ DATA NAME('D'.'A'.'O'I K', 'WRC '/
	C THI C WISC C OUT C STA C CHA	ES ROUTINE STRIPS RAW DATA DOWN TO MIN SIZE, FILLS IN FOR SING RECORDS, FLAGE FOR MISSING HOURLY DATA SET IF MECESSARY FEUT IS SMALLEST USEABLE DATA SEY WHICH STILL COVERS ENTIRE MEACTERS PER SECORD, TOTAL OF 42 RECORDS WITH A HEADER RECORD 120 CHARACTERS CONTAINING DATE, TIME, FILE NAME, MISSING DATA FLAG, RAD DATA FLAG, FIC. NOGOOD SET TO 1 WHEN DATA SET RAD MOTE: CURRENTLY PROCESSING ONLY IN DATA. LOGICAL*: FIRST, ITEMP(120), ITEST LOGICAL*: FIRST, ITEMP(120), DATIME(4), YYMM(4), KEY(12) LOGICAL*: CUREC(13), LAREC(120), DATIME(4), YYMM(4), KEY(12) LOGICAL*: FROW, LROW, IBLN, NREC, NCHRS, THRESH, BAD SEAL** RKEY(T) FOUTUAL FNCE (RKEY(T), KEY(T)), (CUREC(T), IREC(T)) FOUTUAL FNCE (HEADER(9), NAME(T)), (HEADER(1A), PMPTY) FOUTUAL FNCE (HEADER(1S), IBAD), (NAME(A), NAME(A)), NAME(A(T)) DATA RKEY(Y) NSMA'.'O1 K', WBC.'/
	C THI C WISC C OUT C STA C CHA	SECUTINE STRIPS RAW DATA DOWN TO MIN SIZE. FILLS IN FOR SING RECORDS. FLAGE FOR MISSING HOURLY DATA SET? IF MECESSARY FEUT IS SMALLEST USEABLE DATA SEY WHICH STILL COVERS ENTIRE MEACTERS PER SECORD. TOTAL OF 42 RECORDS WITH A HEADER RECORD 120 CHARACTERS CONTAINING DATE, TIME.FILE NAME.MISSING DATA FLAG.RAD DATA FLAG.FIC. NOGOOD SET TO 1 WHEN DATA SET RAD MOTE: CURRENTLY PROCESSING ONLY IN DATA. LOGICAL*1 FIRST, ITEMP(120), ITEST LOGICAL*1 FIRST, ITEMP(120), ITEST LOGICAL*1 GUREC(120), HEADER(120), DATIME(4), YYMM(4), KEY(12) LOGICAL*1 GUREC(131), LAREC(120), IRAD.EMPTY, NAME(S), NAME4(2) INTEGER IROW.LROW, IRLN, NREC, NCHRS, THRESH, BAD SEAL*A RKEY(T) FOUTUAL FNCE (HEADER(1), YYMM(1)), (HEADER(S), DATIME(1)) FOUTUAL FNCE (HEADER(1), NAME(1)), (HEADER(1A), FMPTY) FOUTUAL FNCE (HEADER(1), NAME(1)), (HEADER(1A), FMPTY) DATA NAME('D'.'A'.'O'I K', 'WRC '/ DATA NAME('D'.'A'.'O'I K', 'WRC '/ DATA NAME('D'.'A'.'O'I K', 'WRC '/
	C THI	IS ROUTINE STRIPS RAW DATA DOWN TO MIN SIZE, FILLS IN FOR SING RECORDS, FLAGS FOR MISSING HOURLY DATA SETS IF MECSSARY FEUT IS SMALLEST USEABLE DATA SEY WHICH STILL COVERS ENTIRE MYE AREA (WITH LEAST AMOUNT OF SYTRA SEACE), FOR IS, 120 MRACTERS PER SECORD, TOTAL OF 42 RECORDS WITH A HEADER RECORD 120 CHARACTERS CONTAINING DATE, TIME, FILE MAHE, MISSING DATA FLAG, RAD DATA FLAG, FIC. NOGOOD SET TO 1 WHEN DATA SET BAD MOTE: CURRENTLY PROCESSING DAY IR DATA. MYERKERSESSESSESSESSESSESSESSESSESSESSESSESSE
	C THI	SECUTINE STRIPS RAW DATA DOWN TO MIN SIZE. FILLS IN FOR SING RECORDS. FLAGE FOR MISSING HOURLY DATA SET? IF MECESSARY FEUT IS SMALLEST USEABLE DATA SEY WHICH STILL COVERS ENTIRE MEACTERS PER SECORD. TOTAL OF 42 RECORDS WITH A HEADER RECORD 120 CHARACTERS CONTAINING DATE, TIME.FILE NAME.MISSING DATA FLAG.RAD DATA FLAG.FIC. NOGOOD SET TO 1 WHEN DATA SET RAD MOTE: CURRENTLY PROCESSING ONLY IN DATA. LOGICAL*1 FIRST, ITEMP(120), ITEST LOGICAL*1 FIRST, ITEMP(120), ITEST LOGICAL*1 GUREC(120), HEADER(120), DATIME(4), YYMM(4), KEY(12) LOGICAL*1 GUREC(131), LAREC(120), IRAD.EMPTY, NAME(S), NAME4(2) INTEGER IROW.LROW, IRLN, NREC, NCHRS, THRESH, BAD SEAL*A RKEY(T) FOUTUAL FNCE (HEADER(1), YYMM(1)), (HEADER(S), DATIME(1)) FOUTUAL FNCE (HEADER(1), NAME(1)), (HEADER(1A), FMPTY) FOUTUAL FNCE (HEADER(1), NAME(1)), (HEADER(1A), FMPTY) DATA NAME('D'.'A'.'O'I K', 'WRC '/ DATA NAME('D'.'A'.'O'I K', 'WRC '/ DATA NAME('D'.'A'.'O'I K', 'WRC '/
	C THI	IS ROUTINE STRIPS RAW DATA DOWN TO MIN SIZE, FILLS IN FOR SING RECORDS, FLAGS FOR MISSING HOURLY DATA SETS IF MECSSARY FEUT IS SMALLEST USEABLE DATA SEY WHICH STILL COVERS ENTIRE MYE AREA (WITH LEAST AMOUNT OF SYTRA SEACE), FOR IS, 120 MRACTERS PER SECORD, TOTAL OF 42 RECORDS WITH A HEADER RECORD 120 CHARACTERS CONTAINING DATE, TIME, FILE MAHE, MISSING DATA FLAG, RAD DATA FLAG, FIC. NOGOOD SET TO 1 WHEN DATA SET BAD MOTE: CURRENTLY PROCESSING DAY IR DATA. MYERKERSESSESSESSESSESSESSESSESSESSESSESSESSE
	C THI	CE COUTINE STRIPS RAW DATA DOWN TO MIN SIZE FILLS IN FOR SIZE RECORDS, SLAGS FOR MISSING MOURLY DATA SETS IF MECESSARY SETUT IS SMALLEST USEABLE DATA SET MMICH STILL COVERS ENTIRE AREA (WITH LEAST AMOUNT OF EYTRA SEACE). FOR IR, 120 MRACTERS PER RECORD. TOTAL OF 42 RECORDS WITH A HEADER RECORD 120 CHARACTERS CONTAINING DATE.TIME.FILE NAME.MISSING DATA FLAG.ETC. NOGOOD SET TO 1 WHEN DATA SET RAD NOTE: CURRENTLY PROCESSING ONLY IN DATA. LOGICAL**I FIRST.ITEMP(120).ITEST LOGICAL**I FIRST.ITEMP(120).ITEST LOGICAL**I FIRST.ITEMP(120).ITEST LOGICAL**I CUREC(131).LAREC(120).DATINE(4).YYMM(4).KEY(12) LOGICAL**I CUREC(131).LAREC(120).IRAD.EMPTY.NAME(S).NAME4(2) INTEGER IROW.LROW.IRLK.NREC.NCHRS.THRESH.BAD GEAL**A RKEY(1) EQUIVALENCE (HEADER(1).YYMM(1)).(HEADER(S).DATIME(1)) EQUIVALENCE (HEADER(1).YYMM(1)).(HEADER(14).EMETY) EQUIVALENCE (HEADER(1).IRAD).(NAME(A).NAMEA(1)) DATA RKEY/YNSHA'.'O1 K', 'MBC '/ DATA MAME/'D', 'A'.'T'.'O'.'O'/.THRESM/26/ NOGOOD=O
	C THIS STATE OF THE STATE OF TH	CS ROUTINE STRIPS RAW DATA DOWN TO MIN SIZE FILLS IN FOR SING RECORDS, FLAGS FOR MISSING HOURLY DATA SETS IF MECESSARY TEUT IS SMALLEST USEABLE DATA SET WHICH STILL COURSE ENTIRE MEETERS PER SECORD. TOTAL OF AZ RECORDS WITH A HEADER RECORD 120 CHARACTERS FOR TAINING DATE, TIME, FILE NAME, MISSING DATA FLAG, BAD DATA FLAG, ETC. NOGOOD SET TO 1 WHEN DATA SET BAD MOTE: CURRENTLY PROCESSING ONLY IK DATA. LOGICAL**I FIRST, ITEMP(120), ITEST 10GICAL**I FIRST, ITEMP(120), ITEST 10GICAL**I FIRST, ITEMP(120), ITEST 10GICAL**I FIRST, ITEMP(120), ITEST 10GICAL**I REC(120), HEADER(120), DATIME(4), YYMM(4), KEY(12) INTEGER IROW, LROW, IBLK, NREC, NCHRS, THRESH, BAD SEAL**A RKEY(T) EQUIVALENCE (HEADER(1), YYMM(1)), (MEADER(1), IREC(1)) EQUIVALENCE (HEADER(1), YYMM(1)), (MEADER(1), EMETY) EQUIVALENCE (HEADER(1), TARD), (NAME(A), NAME(A)) NAME (1)) DATA RKEY/NSMA', OI K', WRC '/ NAME ARE RECORD ENCODE(4,10,YYMM) IYR, IMO
	C THI	CS COUTINE STRIPS RAW DATA DOWN TO MIM SIZE FILLS IN FOR SEING RECORDS, FLAGS FOR MISSING MOURLY DATA SETT IF NECESSARY FEUT IS SMALLEST DEFABLE DATA SET MMICH STILL COVERS ENTIRE ATE AREA (WITH LEAST AMOUNT OF EYTRA SEACE) FOR IR. 120 REACTERS PER SECORD, TOTAL OF AS RECORDS WITH A HEADER RECORD 120 CHARACTERS CONTAINING DATE, TIME.FILE NAME.MISSING DATA FLAG, RAD DATA FLAG, FIC. NOCODD SET TO 1 WHEN DATA SET RAD MOTE: CURRENTLY PROCESSING ONLY IN DATA. MEXIMAXIMATINAMINAMINAMINAMINAMINAMINAMINAMINAMINAM
	C THIS STATE OF THE STATE OF TH	CS ROUTINE STRIPS RAW DATA DOWN TO MIN SIZE FILLS IN FOR SING RECORDS, FLAGS FOR MISSING HOURLY DATA SETS IF MECESSARY TEUT IS SMALLEST USEABLE DATA SET WHICH STILL COURSE ENTIRE MEETERS PER SECORD. TOTAL OF AZ RECORDS WITH A HEADER RECORD 120 CHARACTERS FOR TAINING DATE, TIME, FILE NAME, MISSING DATA FLAG, BAD DATA FLAG, ETC. NOGOOD SET TO 1 WHEN DATA SET BAD MOTE: CURRENTLY PROCESSING ONLY IK DATA. LOGICAL**I FIRST, ITEMP(120), ITEST 10GICAL**I FIRST, ITEMP(120), ITEST 10GICAL**I FIRST, ITEMP(120), ITEST 10GICAL**I FIRST, ITEMP(120), ITEST 10GICAL**I REC(120), HEADER(120), DATIME(4), YYMM(4), KEY(12) INTEGER IROW, LROW, IBLK, NREC, NCHRS, THRESH, BAD SEAL**A RKEY(T) EQUIVALENCE (HEADER(1), YYMM(1)), (MEADER(1), IREC(1)) EQUIVALENCE (HEADER(1), YYMM(1)), (MEADER(1), EMETY) EQUIVALENCE (HEADER(1), TARD), (NAME(A), NAME(A)) NAME (1)) DATA RKEY/NSMA', OI K', WRC '/ NAME ARE RECORD ENCODE(4,10,YYMM) IYR, IMO
	C THIS STATE OF THE STATE OF TH	CS CCUTINE SITIES AND DATA DOWN ID MIN SIZE FILLS IN FOR SEING RECORDS, FLAGS FOR MISSING MOURLY DATA SETT IF NECESSARY FUT IS SHALLEST USEABLE DATA SET UNION STILL COVERS ENTIRE LIFE AREA (MITH LEAST AMOUNT OF FYTRA SEACE) FOR IR. 120 MARCHERS PER SECORD. TOTAL OF 42 RECORDS WITH A HEADER SECORD 120 CHARACTERS CONTAINING DATE, TIME, FILE MAME, MISSING DATA FLAG, FIC. NOGOOD SET TO 1 WHEN DATA SET RAD DOTE: CURRENTLY PROCESSING ONLY IN DATA. LOGICAL*I FIRST, ITEMP(120), ITEST LOGICAL*I FREST, ITEMP(120), ITEST LOGICAL*I FIRST, ITEMP(120), ITEST LOGICAL*I FIRST, ITEMP(120), ITEST LOGICAL*I CURREC(131), LAREC(120), IDATINE(4), YYMM(4), KEY(12) INTEGER IROW, IROW, IRLK, NREC, NCHRS, THRESH, RAD SEAL*A RKEY(7) FOULUALENCE (HEADER(1), YYMM(1)), (MEADER(5), DATIME(1)) FOULUALENCE (HEADER(1), YYMM(1)), (HEADER(1), IMEC(1)) FOULUALENCE (HEADER(1), YMM(1)), (HEADER(1), IMEC(1)) DATA RKEY/NSHG'. OI K', 'MBC // NOGOOD=O FINCODE(4,10, YYMM) IYR, IMO FORMAI(212) FNCODE(4,10, YYMM) IYR, IMO FORMAI(212) FNCODE(4,10, YYMM) IYR, IMO FORMAI(212) FNCODE(4,10, DATIME) IDAY, IMOUR
	C THI	CS COUTINE STRIPS RAW DATA DOWN TO MIM SIZE FILLS IN FOR SEING RECORDS, FLAGS FOR MISSING MOURLY DATA SETT IF NECESSARY FEUT IS SMALLEST DEFABLE DATA SET MMICH STILL COVERS ENTIRE ATE AREA (WITH LEAST AMOUNT OF EYTRA SEACE) FOR IR. 120 REACTERS PER SECORD, TOTAL OF AS RECORDS WITH A HEADER RECORD 120 CHARACTERS CONTAINING DATE, TIME.FILE NAME.MISSING DATA FLAG, RAD DATA FLAG, FIC. NOCODD SET TO 1 WHEN DATA SET RAD MOTE: CURRENTLY PROCESSING ONLY IN DATA. MEXIMAXIMATINAMINAMINAMINAMINAMINAMINAMINAMINAMINAM
	C THIS STATE OF THE STATE OF TH	CS CCUTINE SITIES AND DATA DOWN ID MIN SIZE FILLS IN FOR SEING RECORDS, FLAGS FOR MISSING MOURLY DATA SETT IF NECESSARY FUT IS SHALLEST USEABLE DATA SET UNION STILL COVERS ENTIRE LIFE AREA (MITH LEAST AMOUNT OF FYTRA SEACE) FOR IR. 120 MARCHERS PER SECORD. TOTAL OF 42 RECORDS WITH A HEADER SECORD 120 CHARACTERS CONTAINING DATE, TIME, FILE MAME, MISSING DATA FLAG, FIC. NOGOOD SET TO 1 WHEN DATA SET RAD DOTE: CURRENTLY PROCESSING ONLY IN DATA. LOGICAL*I FIRST, ITEMP(120), ITEST LOGICAL*I FREST, ITEMP(120), ITEST LOGICAL*I FIRST, ITEMP(120), ITEST LOGICAL*I FIRST, ITEMP(120), ITEST LOGICAL*I CURREC(131), LAREC(120), IDATINE(4), YYMM(4), KEY(12) INTEGER IROW, IROW, IRLK, NREC, NCHRS, THRESH, RAD SEAL*A RKEY(7) FOULUALENCE (HEADER(1), YYMM(1)), (MEADER(5), DATIME(1)) FOULUALENCE (HEADER(1), YYMM(1)), (HEADER(1), IMEC(1)) FOULUALENCE (HEADER(1), YMM(1)), (HEADER(1), IMEC(1)) DATA RKEY/NSHG'. OI K', 'MBC // NOGOOD=O FINCODE(4,10, YYMM) IYR, IMO FORMAI(212) FNCODE(4,10, YYMM) IYR, IMO FORMAI(212) FNCODE(4,10, YYMM) IYR, IMO FORMAI(212) FNCODE(4,10, DATIME) IDAY, IMOUR
	C SE	COUTINE STRIPS AND DATA DOWN ID MIN SIZE FILLS IN FOR SEING RECORDS. ELAGS FOR MISSING HOURLY DATA SETS IF MECESSARY. FUT IS SHALLEST USEABLE DATA SEY UNION STILL COVERS ENTIRE LIFE AREA (MITH LEAST AMBRINT OF FYTRA SEACE) FOR IR. 120 MEACTERS PER SECORD. TOTAL OF 42 RECORDS WITH A HEADER RECORD. 120 CHARACTERS CONTAINING DATE, TIMELELLE MAME, MISSING DATA FLAG, HAD DATA FLAG, ETC. MOGGOD SET TO 1 WHEN DATA SET BAD MOTE: CURRENTLY PROCESSING ONLY IN DATA. MEXICAL REMAINS AND MATE AND MOTE SET BAD MOTE COLOR ONLY IN DATA. MEXICAL REMAINS AND MOTE SET MOGGOD SET TO 1 WHEN DATA SET BAD MOTE COLOR ONLY IN DATA. MEXICAL REMAINS AND MOTE SET BAD MOTE SET BAD MOTE COLOR ONLY IN DATA. MEXICAL RECORD HAD MOTE SET BAD MOME SET BAD MOTE SET BAD MOME SE
	C SE	CS CCUTINE SITIES AND DATA DOWN ID MIN SIZE FILLS IN FOR SEING RECORDS, FLAGS FOR MISSING MOURLY DATA SETT IF NECESSARY FUT IS SHALLEST USEABLE DATA SET UNION STILL COVERS ENTIRE LIFE AREA (MITH LEAST AMOUNT OF FYTRA SEACE) FOR IR. 120 MARCHERS PER SECORD. TOTAL OF 42 RECORDS WITH A HEADER SECORD 120 CHARACTERS CONTAINING DATE, TIME, FILE MAME, MISSING DATA FLAG, FIC. NOGOOD SET TO 1 WHEN DATA SET RAD DOTE: CURRENTLY PROCESSING ONLY IN DATA. LOGICAL*I FIRST, ITEMP(120), ITEST LOGICAL*I FREST, ITEMP(120), ITEST LOGICAL*I FIRST, ITEMP(120), ITEST LOGICAL*I FIRST, ITEMP(120), ITEST LOGICAL*I CURREC(131), LAREC(120), IDATINE(4), YYMM(4), KEY(12) INTEGER IROW, IROW, IRLK, NREC, NCHRS, THRESH, RAD SEAL*A RKEY(7) FOULUALENCE (HEADER(1), YYMM(1)), (MEADER(5), DATIME(1)) FOULUALENCE (HEADER(1), YYMM(1)), (HEADER(1), IMEC(1)) FOULUALENCE (HEADER(1), YMM(1)), (HEADER(1), IMEC(1)) DATA RKEY/NSHG'. OI K', 'MBC // NOGOOD=O FINCODE(4,10, YYMM) IYR, IMO FORMAI(212) FNCODE(4,10, YYMM) IYR, IMO FORMAI(212) FNCODE(4,10, YYMM) IYR, IMO FORMAI(212) FNCODE(4,10, DATIME) IDAY, IMOUR
	C SE	S ROUTINE STRIPS RAN DATA DOWN IN MIN SIZE FILLS IN FOR SENDE RECORDS, FLAGS FOR MISSING HOUSELY DATA SETZ IF MECESSARY FUT IS SMALLEST USEABLE DATA SET HMICH STILL COVERS ENTIRE LIE AREA (MITH LEAST AMOUNT OF EXTRA SEACE) FOR IR, 120 REACTERS PER SERIOR. TOTAL OR &Z RECORDS WITH A HEADER RECORD 120 CHARACTERS CONTAINING DATE, TIME, FILE NAME, MISSING DATA FLAGSBAD DATA FLAGSETC. NOGOOD SET TO 1 WHEN DATA SET BAD MOTE: CHERRENT! PROCESSING ONLY IK DATA. MISHAWARAHAMAMAMAMAMAMAMAMAMAMAMAMAMAMAMAMAMAM
	C SE	COUTINE STRIPS AND DATA DOWN ID MIN SIZE FILLS IN FOR SEING RECORDS. ELAGS FOR MISSING HOURLY DATA SETS IF MECESSARY. FUT IS SHALLEST USEABLE DATA SEY UNION STILL COVERS ENTIRE LIFE AREA (MITH LEAST AMBRINT OF FYTRA SEACE) FOR IR. 120 MEACTERS PER SECORD. TOTAL OF 42 RECORDS WITH A HEADER RECORD. 120 CHARACTERS CONTAINING DATE, TIMELELLE MAME, MISSING DATA FLAG, HAD DATA FLAG, ETC. MOGGOD SET TO 1 WHEN DATA SET BAD MOTE: CURRENTLY PROCESSING ONLY IN DATA. MEXICAL REMAINS AND MATE AND MOTE SET BAD MOTE COLOR ONLY IN DATA. MEXICAL REMAINS AND MOTE SET MOGGOD SET TO 1 WHEN DATA SET BAD MOTE COLOR ONLY IN DATA. MEXICAL REMAINS AND MOTE SET BAD MOTE SET BAD MOTE COLOR ONLY IN DATA. MEXICAL RECORD HAD MOTE SET BAD MOME SET BAD MOTE SET BAD MOME SE

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, C URITE OUT MEADER RECORD
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• 6
1 C PROCESS DATA SET
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BA0=0
LSCHILA
13LX=0
FIRST- TRUE
NREC=0
100 CALL ROATA/CUREC, NCHES, IERR, ICHDAI, IRLK, FIRST)
FIRST- FALSE
NEEC-NEEC+1
TECHCHES ED 131 \GD 70 200
C CHECK FOR MANO : KHRC RECORD
IF (NCMES NE 12) GO TO 100
00 110 Tale4
IF (XEY(I) NE CUREC(I) NG TO 100
LIA CONTINUE
G GHECK TIME DATE RECORD
DO 120 I=13-16
IF(CUREC(1) ME DATIME(1-12))GD TD 7900
120 CONTINUE
C :11 CHARACTERS, CHECK FOR MURRER FOR POSITIONING
210 FORMAT(12)
C MAKE SUPE IROU IS MALID
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C SHEEK IROU LE DA OR IROU GE LOONGO TO SOO C CHEEK IROU INSIDE STATE ROUNDARIES C IF (IROU LE IA AND LROU ED JANGO TO LOO IF (IROU LE JA OR IROU DE 74) GO TO AOO C GOOD DATA ROU. CHECK FOR SKIPS IN DATA
C SHEEK IROU LE DA OR IROU GE LOONGO TO SOO C CHEEK IROU INSIDE STATE ROUNDARIES C IF (IROU LE IA AND LROU ED JANGO TO LOO IF (IROU LE JA OR IROU DE 74) GO TO AOO C GOOD DATA ROU. CHECK FOR SKIPS IN DATA
FITTINGULE O COLIROU GE 100 GO TO 500 C CHEEK IROU INSTRE STATE ROUNDARIES C IF (IROU LE IA AND LROU ED IA)CO TO 100 IF (IROU LE IA OR IROU DE 74)CO TO 400 C GOOD DATA ROU CHECK FOR SKIPS IN DATA C IF (IROU LA IA IA)CO TO 100 C IF (IROU LE IA IA)CO TO 100
FITTINGULE O COLIROU GE 100 GO TO 500 C CHEEK IROU INSTRE STATE ROUNDARIES C IF (IROU LE IA AND LROU ED IA)CO TO 100 IF (IROU LE IA OR IROU DE 74)CO TO 400 C GOOD DATA ROU CHECK FOR SKIPS IN DATA C IF (IROU LA IA IA)CO TO 100 C IF (IROU LE IA IA)CO TO 100
C CHECK IROU INSIDE STATE ROUNDARIES C CHECK IROU INSIDE STATE ROUNDARIES C IF (IROU LE IA AND LROU ED IA)GO TO 100 IF (IROU LE IA OR IROU DE IA)GO TO 400 C GOOD DATA ROU CHECK FOR SKIPS IN DATA C ISCITA-IROU LAGU IF (IDELTA-LROU LAGO IF (IDELTA-LOUND TO 100 IF (IDELTA-LOUND TO 100 IF (IDELTA-DATA BY USIGNED AVERAGING
######################################
C CHECK IRON INSIDE STATE ROUNDARIES G CHECK IRON INSIDE STATE ROUNDARIES G IF (IRON LZ IA AND LRON ED IA)CO TO 100 IF (IRON LZ IA AND LRON ED IA)CO TO 100 IF (IRON LZ IA AND LRON ED IA)CO TO 100 IF (IRON LZ IA AND LRON ED IA)CO TO 100 IF (IRON LZ IA AND LRON ED IA)CO TO 100 IF (IRON LZ IA AND LRON ED IA)CO TO 100 IF (IRON LA LT IA)CO TO 100 IF (IRON LA LT IA)CO TO 100 IF (IRON MISSING DATA BY VEIGHTED AVERAGING IRON LRON EUROSIST IN MISSING IN DATA BY VEIGHTED AVERAGING IN MISSING IN TOUR ED IA)CO TO 100 IN MISSIN
C IF (IROU LE 0 09 IROU GE 100) GO TO 500 C CHECK IROU INSIDE STATE SCUNDARIES G IF (IROU LE 14 AND LROU ED 14) GO TO 100 IF (IROU LE 14 AND LROU ED 14) GO TO 100 G GOOD DATA SQU. CHECK FOR SKIPS IN DATA G ISSIDELTA LE 1) GO TO 100 IF (IDSI TA ED 1) GO TO 100 IF (IDSI TA ED 1) GO TO 100 G FILL IN FOR MISSING DATA BY WEIGHTED AVERAGING INSIDELTA N= IDSI TA INI N= IDSI TA INI INI INI INI INI INI INI I
C
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CONTINUES OF TAILS OF TO SOO CONTINUES OF TAILS OF TO SOO CONTINUES
C
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Kak-1
250 CONTINUE
C FILL IN COMPLETE, GO WRITE CURRENT RECORD
C URITE CHERENT RECORD, HOUS CHERENT RECORD INTO LAST REC.
C AND UPDATE LEGN
700 TREC(120)=CUREC(131)
C CHECK CHARACTERS IN SON FOR SATURATION FREDR.
C THIS OCCURS WHEN ALL CHARACTERS IN ROW ARE THE SAME.
C THIS CONDITION IS IMPOSSIBLE IN GOOD DATA AND IS
C GROUNDS FOR THROWING OUT THE ROW AS BAD DATA.
TTEST=IREC(1)
IF(ITEST.NE.IREC(MM))GO TO 320
315 CONTINUE
C SATURATED ROW. THROW OUT AS BAD DATA
GO TO 500
T20 WRITE/IUSAT/IAUSAT.FRR=8000) IREC
DO 350 I#1-120
LAREC(I)=IREC(I)
II JEO CONTINUE
I SOUM FOUND
. C . C . C . C . C . C . C . C . C . C
' C SON OUT OF STATE BOUNDARIES
' C
* 400 IE/IRON-LT-74\GO TO 500 IE/IRON-GE-75\GO TO 1700
. IF(180W.GF.75)GD TO 1700
· c
C SOME ROWS MISSING AT FND. FILL BY REPEATING LAST RECORD
1 C
JJ=LROW+1
00 450 I=JJ-75
URITE (JUSAT / JAUSAT - ERR=8000) LAREC
450 CONTINUE
G DAD REGORD ENGOUNTERED, SOUNT TRAD AND THEN GO READ ANOTHER RECORD
S DIE REGION CHILD STATE TO ST
500 BAD-BAD+1
90 TO 100
C CHECK FOR *BAD RECORDS AGAINST THRESHOLD
1700 IE (BAD. LE. THRESH) RETURN
C OFF DAD SLAG OFFICIAL SLAGS
- C SET BAD FLAG. REWRITE HEADER WITH FLAG
woggen= t
I DA BALL
IF/FIRST.GT.JS)EMPTY='1'
URITE (JUSAT 1 : FRR=8000) HEADER
RETURN
C ERROR HEITING OUT FILE
C C C C C C C C C C C C C C C C C C C
URITE(5.*)' ***ERROR WHILE WRITING OUTPUT FILE - SET EMPTY'
90 TO 2900
C FREDR READING INPUT FILE
7000 URITE(6+*)' ***ERROR UHILE READING INPUT FILE - SET OUTPUT EMPTY'
URITE(5.4)' ***ERRCR READING FILE'
N0600P=1
WRITE(4-+) TERR-ICHDAT NREC-NGHRG-IDAY-IHOUR
URITE(IUSAT'1)HEADER
RETURN
TEND THE TEND
12
10
,

The second secon
SUBBOUTTHE SOUTH (TOTAL NOWES, IERR, ICHON, ISLK, FIRST)
C THIS ROUTINE READS DATA FROM THE DISK FILE (ICHAM) IN PLOCKS
C OF SIG CHARACTERS AND RETURNS THIS DATA I THE BY I THE TO THE CALLING
C SPORTAM LITA TRATA, LITTU THE MINESPORT OF CHARACTERS IN THE TWO AND
C NCHES. AND ANY FERRE CONDITIONS IN IERE AS FOLLOWS!
2 1500 - 2 5000 0011
C IFRE # 0 SOOD READ
C -1 FND OF FILE ON DISK (NCHRS=0)
C -1 FERROR READING BLOCK (NCHES=0)
C TRIK IS THE RICEY & TO BE SEAD NEXT (O REFERENCED). AND SHOULD
C BE SET TO 0 BY THE CALLING PROGRAM ON THE FIRST CALL, BUT NOT
C CHANGED UNTIL THE ENTIRE FILE HAS BEEN READ.
C NOTE: MAX OF 131 CHARACTERS PER I INF SETURNED TO CALLING PROGRAM
C INDIANAMATAN AND AND AND AND AND AND AND AND AND A
DIMENSION TUDIE (PPL)
OTHERSON TURNEY COLA
LOGICAL X1 IBUF(G12), IDATA(131), FIRST
FOLIVALENCE (INBUF(!).IBUF(!))
IF/FIRST) Laft12
C I = CHARACTER POSITION IN IRUF
C I - CHARACTER POSITION IN IDATA
YCHES#0
w 1
15(1.1 T.512)GR TD 100
C SEAD IN A MEN BURCK OF DATA
The state of the s
10 IFREIREADU(CSA, INRIE, IDIX, ICUAN)
[3] K#[3] K+1
TECTER LT O RETURN
TECTER LT ON RETURN
TECTER LT A) RETURN THO CHARACTERS FROM TRUE TO IDATA
TECTER LT ON RETURN
C HOVE CHARACTERS FROM TRUE TO IDATA
C HOUS CHARACTERS FROM TRUE TO IDATA C 100 Table TECL OF SIZE OF TRUE
C HOWE CHARACTERS FROM TRUE TO IDATA 100 Lath: 100 Lath
C HOUSE CHARACTERS SERON TRUE TO IDATA C 100 Talbi II TELLI GT 5123 GO TO 10
TECTERS IT AN RETURN C HOVE CHARACTERS FROM TRUE TO IDATA C 100 Lata: I EXTLAT.5123 GO TO 10
TECTER LT ON RETURN C C HOWE CHARACTERS FROM TRUE TO IDATA C HOUSE CHARACTERS FROM TRUE TO IDATA C C CHECK FOR CARRIAGE RETURN C C CHECK FOR CARRIAGE RETURN
TECTER IT OF RETURN C HOVE CHARACTERS FROM TRUE TO IDATA C 100 I=I+1 I
THO THE CHARACTERS FROM TRUE TO TOATA C HOUSE CHARACTERS FROM TRUE TO TOATA 100 THE TOATA TO
THO THE CHARACTERS FROM TRUE TO TOATA C HOUSE CHARACTERS FROM TRUE TO TOATA 100 THE TOATA TO
TECTER LT ON RETURN C HOWE CHARACTERS FROM TRUE TO IDATA C HOUSE CHARACTERS FROM TRUE TO IDATA
TECTER LT ON RETURN C C HOWE CHARACTERS FROM TRUE TO IDATA C HOUSE CHARACTERS FROM TRUE TO IDATA C HOUSE CHARACTERS FROM TRUE TO IDATA C HOUSE CHARACTERS FROM TRUE TO IDATA C C CHECK FOR CARRIAGE RETURN C C CHECK FOR MO DATA YET
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TECTER IT ON RETURN THO C HOUSE CHARACTERS FROM TRUE TO IDATA C CHECK FOR CARRIAGE RETURN C HECK FOR NO DATA YET C HICH FOR INCO TO 100 I NCHRSE III FETURN
TECTIER LT ON RETURN C C C HOUSE CHARACTERS FROM TRUE TO IDATA C 100 LEID TECTION TECTION C C C C C C C C C C C C C
TECTIER LT ON RETURN C HOWE CHARACTERS FROM TRUE TO IDATA C HOUSE CHARACTERS FROM TRUE TO IDATA I TECTION TO TO TO C CHECK FOR CARRIAGE RETURN C TECTIBLE(I), NE. 1153 GO TO 200 C CHECK FOR NO DATA YET C TECTIER C CHECK FOR NO DATA YET C SETURN C CHECK FOR ILLEDAL OR CONTROL CHARACTER ID SKIP
TECTIER LT ON RETURN C C C HOUSE CHARACTERS FROM TRUE TO IDATA C 100 LEID TECTION TECTION C C C C C C C C C C C C C
TECTIER LT ON RETURN C HOWE CHARACTERS FROM TRUE TO IDATA C HOUSE CHARACTERS FROM TRUE TO IDATA I TECTION TO TO TO C CHECK FOR CARRIAGE RETURN C TECTIBLE(I), NE. 1153 GO TO 200 C CHECK FOR NO DATA YET C TECTIER C CHECK FOR NO DATA YET C SETURN C CHECK FOR ILLEDAL OR CONTROL CHARACTER ID SKIP
IF (IFPRITED AND RETURN I SO C HOUSE CHARACTERS FROM IBLIS TO IDATA C 100 L=141 I
IF (IFPRITED AND RETURN I SO C HOUSE CHARACTERS FROM IBLIS TO IDATA C 100 L=141 I
IF (IFPRITED RETURN ISO C HOUSE CHARACTERS FROM IBLIS TO IDATA C HOUSE CHARACTERS FROM IBLIS TO IDATA C HOUSE CHARACTERS FROM IBLIS TO IDATA I HOUSE CHARACTERS FROM IBLIS TO IDATA I C CHECK FOR CARRIAGE RETURN I C CHECK FOR NO DATA YET C CHECK FOR NO DATA YET C CHECK FOR ILLEBAL OR CONTROL CHARACTER TO SKIP C CHECK FOR ILLEBAL OR CONTROL CHARACTER TO SKIP C CHECK FOR ILLEBAL OR CONTROL CHARACTER TO SKIP C CHECK FOR ILLEBAL OR CONTROL CHARACTER TO SKIP C CHECK FOR ILLEBAL OR CONTROL CHARACTER TO SKIP C CHECK FOR ILLEBAL OR CONTROL CHARACTER TO SKIP
IF (IFPRITED AND RETURN I SO C HOUSE CHARACTERS FROM IBLIS TO IDATA C 100 L=141 I
TEACHER LT ON RETURN C HOUSE CHARACTERS FROM IBUSE ID IDATA C LICIA LICIA STORY OF TO 10 C CHECK FOR CARRIAGE RETURN C LICIBUSE(1), NE 1153, GD ID 200 C CHECK FOR NO DATA YET C LICIBUSE(1) CONTROL CHARACTER ID SKIP C CHECK FOR ILLEBAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILLEBAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILLEBAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILLEBAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILLEBAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILLEBAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILLEBAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILLEBAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILLEBAL OR CONTROL CHARACTER SETURNED IN IDATA C TRANSFER CHARACTER TO IDATA, MAY OF 131 CHARACTERS SETURNED IN IDATA
INTITION OF RETURN LEG C HOME CHARACTERS FROM TRUE TO IDATA C 100 L=141 I I IF LEGIT SIZE OF TO 10 C CHECK FOR CARRIAGE RETURN C IF LIBHELL NELLS OF TO 200 C CHECK FOR MC DATA YET C CHECK FOR MC DATA YET C CHECK FOR ILLEGAL OF CONTROL CHARACTER IN SKIP C CHECK FOR ILLEGAL OF CONTROL CHARACTER IN SKIP C CHECK FOR ILLEGAL OF CONTROL CHARACTER RETURNED IN IDATA G TRANSFER CHARACTER TO IDATA, MAY OF 131 CHARACTERS RETURNED IN IDATA G IF LIGHT LIVE IDATA (1) - IDATA G IF LIGHT LIVE IDATA (1) - IDATA (1) - IDATA G IF LIGHT LIVE IDATA (1) - IDATA (1) - IDATA
IF (IFRE LT O) RETURN C HOUS CHARACTERS FROM TRUE TO IDATA C 100 Lath: I 15/1 OT 512) OD TO 10 C CHECK FOR CARRIAGE RETURN C IF (ISHE (I) , NE . 15) OD TO 200 C CHECK FOR NO DATA YET C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER RETURNED IN IDATA G TRANSFER CHARACTER TO IDATA. MAY OF 131 CHARACTERS RETURNED IN IDATA G TO 100
INTITION OF RETURN LEG C HOME CHARACTERS FROM TRUE TO IDATA C 100 L=141 I I IF LEGIT SIZE OF TO 10 C CHECK FOR CARRIAGE RETURN C IF LIBHELL NELLS OF TO 200 C CHECK FOR MC DATA YET C CHECK FOR MC DATA YET C CHECK FOR ILLEGAL OF CONTROL CHARACTER IN SKIP C CHECK FOR ILLEGAL OF CONTROL CHARACTER IN SKIP C CHECK FOR ILLEGAL OF CONTROL CHARACTER RETURNED IN IDATA G TRANSFER CHARACTER TO IDATA, MAY OF 131 CHARACTERS RETURNED IN IDATA G IF LIGHT LIVE IDATA (1) - IDATA G IF LIGHT LIVE IDATA (1) - IDATA (1) - IDATA G IF LIGHT LIVE IDATA (1) - IDATA (1) - IDATA
IF (IFRE LT O) RETURN C HOUS CHARACTERS FROM TRUE TO IDATA C 100 Lath: I 15/1 OT 512) OD TO 10 C CHECK FOR CARRIAGE RETURN C IF (ISHE (I) , NE . 15) OD TO 200 C CHECK FOR NO DATA YET C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER RETURNED IN IDATA G TRANSFER CHARACTER TO IDATA. MAY OF 131 CHARACTERS RETURNED IN IDATA G TO 100
IF (IFRE LT O) RETURN C HOUS CHARACTERS FROM TRUE TO IDATA C 100 Lath: I 15/1 OT 512) OD TO 10 C CHECK FOR CARRIAGE RETURN C IF (ISHE (I) , NE . 15) OD TO 200 C CHECK FOR NO DATA YET C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER RETURNED IN IDATA G TRANSFER CHARACTER TO IDATA. MAY OF 131 CHARACTERS RETURNED IN IDATA G TO 100
IF (IFRE LT O) RETURN C HOUS CHARACTERS FROM TRUE TO IDATA C 100 Lath: I 15/1 OT 512) OD TO 10 C CHECK FOR CARRIAGE RETURN C IF (ISHE (I) , NE . 15) OD TO 200 C CHECK FOR NO DATA YET C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER RETURNED IN IDATA G TRANSFER CHARACTER TO IDATA. MAY OF 131 CHARACTERS RETURNED IN IDATA G TO 100
IF (IFRE LT O) RETURN C HOUS CHARACTERS FROM TRUE TO IDATA C 100 Lath: I 15/1 OT 512) OD TO 10 C CHECK FOR CARRIAGE RETURN C IF (ISHE (I) , NE . 15) OD TO 200 C CHECK FOR NO DATA YET C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER RETURNED IN IDATA G TRANSFER CHARACTER TO IDATA. MAY OF 131 CHARACTERS RETURNED IN IDATA G TO 100
IF (IFRE LT O) RETURN C HOUS CHARACTERS FROM TRUE TO IDATA C 100 Lath: I 15/1 OT 512) OD TO 10 C CHECK FOR CARRIAGE RETURN C IF (ISHE (I) , NE . 15) OD TO 200 C CHECK FOR NO DATA YET C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER RETURNED IN IDATA G TRANSFER CHARACTER TO IDATA. MAY OF 131 CHARACTERS RETURNED IN IDATA G TO 100
IF (IFRE LT O) RETURN C HOUS CHARACTERS FROM TRUE TO IDATA C 100 Lath: I 15/1 OT 512) OD TO 10 C CHECK FOR CARRIAGE RETURN C IF (ISHE (I) , NE . 15) OD TO 200 C CHECK FOR NO DATA YET C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER RETURNED IN IDATA G TRANSFER CHARACTER TO IDATA. MAY OF 131 CHARACTERS RETURNED IN IDATA G TO 100
IF (IFRE LT O) RETURN C HOUS CHARACTERS FROM TRUE TO IDATA C 100 Lath: I 15/1 OT 512) OD TO 10 C CHECK FOR CARRIAGE RETURN C IF (ISHE (I) , NE . 15) OD TO 200 C CHECK FOR NO DATA YET C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER RETURNED IN IDATA G TRANSFER CHARACTER TO IDATA. MAY OF 131 CHARACTERS RETURNED IN IDATA G TO 100
IF (IFRE LT O) RETURN C HOUS CHARACTERS FROM TRUE TO IDATA C 100 Lath: I 15/1 OT 512) OD TO 10 C CHECK FOR CARRIAGE RETURN C IF (ISHE (I) , NE . 15) OD TO 200 C CHECK FOR NO DATA YET C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER RETURNED IN IDATA G TRANSFER CHARACTER TO IDATA. MAY OF 131 CHARACTERS RETURNED IN IDATA G TO 100
IF (IFRE LT O) RETURN C HOUS CHARACTERS FROM TRUE TO IDATA C 100 Lath: I 15/1 OT 512) OD TO 10 C CHECK FOR CARRIAGE RETURN C IF (ISHE (I) , NE . 15) OD TO 200 C CHECK FOR NO DATA YET C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER RETURNED IN IDATA G TRANSFER CHARACTER TO IDATA. MAY OF 131 CHARACTERS RETURNED IN IDATA G TO 100
IF (IFRE LT O) RETURN C HOUS CHARACTERS FROM TRUE TO IDATA C 100 Lath: I 15/1 OT 512) OD TO 10 C CHECK FOR CARRIAGE RETURN C IF (ISHE (I) , NE . 15) OD TO 200 C CHECK FOR NO DATA YET C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER RETURNED IN IDATA G TRANSFER CHARACTER TO IDATA. MAY OF 131 CHARACTERS RETURNED IN IDATA G TO 100
IF (IFRE LT O) RETURN C HOUS CHARACTERS FROM TRUE TO IDATA C 100 Lath: I 15/1 OT 512) OD TO 10 C CHECK FOR CARRIAGE RETURN C IF (ISHE (I) , NE . 15) OD TO 200 C CHECK FOR NO DATA YET C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER ID SKIP C CHECK FOR ILL FRAL OR CONTROL CHARACTER RETURNED IN IDATA G TRANSFER CHARACTER TO IDATA. MAY OF 131 CHARACTERS RETURNED IN IDATA G TO 100

	SUBROUTINE QUICK(TUSAT, TURAT, TAUSAT, TAUSAT)

	S ROUTINE CONVERTS THE SATELLITE DATA TO RAINFALL
	E FOR FACH HOURS DATA.

	LOGICAL*1 IDATA(120)
	REAL RAIN(120) HEAD(120)
	FQUIVALENCE (IDATA(1), HEAD(1))
c	CHOLYMCHILE SANGIBLE (THERE) ATT
	N HEADER RECORD
	TAUSAT = 1
	TAURATAL
	READ(TUSAT'TAVSAT)IDATA
	WRITE(IURAL'IAVRAL)HEAD
C CON	WERT DATA TO RAINFALL
C	
	DO 500 1×2.42
	REAR(TUSAT/TAUSAT). [DATA
	CALL LOOKUP(IDATA:RAIN)
-	HRITE(TURAT/TAURAT)RAIN
500	CONTINUE
	RETURN
	FND
12	
11	
† † † † † † † † † † † † † † † † † † †	
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å.	
	SUBROUTINE LOOKUP(IDATA, RDATA)
CHANNE	************************************
	IS SCUTINE CONVERTS THE SATELLITE TEMPERATURE DATA
	BAINFALL BATE VIA A LOCKUP TABLE DEVELOPED BY
	LT FOLLANSPER

	REAL RAIN(96)-RDATA(120)
	LOGICAL*1 IDATA(120):IFIRST
	DATA RAIN/9440 O/ IF PST/ TRUE /
_	
	STREET CALL COURTS TABLE
	FIRST CALL, GENERATE TAPLE
	IF(-NOT-IFIRST) GO TO 50
	IFIRSTA FALSE.
	CON=0.0
	DO 10 1-10-54
	CDN=CDN+C.01
	RAIN(I) #CON
	CONTINUE
	00 20 1455.94
	CON=CON+O. OS
	RAIN(I)=GON
	CONTINUE
- 60	NUERT DATA TO RAINFALL AMOUNTS FROM LOCKUP TAPLE
50	DO 100 T=1.119
	******** *********** ***

100 CONTINUE
C HOVE ROU HUMBER SHITO REAL ARRAY
TOTAL TOTAL STATE OF THE STATE
OECODE(1-150-10ATA(120)) RDATA(120)
RETURN
END
"
10 1 1 1 1
•
•
1
,
1
-
1
SURROUTINE LOCKUP(IDATA, ADATA)
C*************************************
C THIS SOUTINE CONVERTS THE SATEL ITE TEMPERATURE DATA
C TO SAINFALL SATE HIA A LOCKUP TABLE DEUELGEED BY
C WALT FOLLANSREF.
C4848334434434313131313131313131313131313
SEAL RAIN(96), RDATA(120)
LOGICAL*: IDATA(122).IFIRST
DATA RAIN/96#0.0/.IFIRST/.TRUE./
C
C ON FIRST CALL, GENERATE TABLE
C C C C C C C C C C C C C C C C C C C
IF(.NOT.IFIRST) GR TO 50
IFIRST - FALSE.
CON=0.005
00 10 7=22.51
CON=CON+0.005
SAIN(I)=CON
10 CONTINUE
DO 70 1=55.94
CDN=CDN+0.0A
SAIM(I)=CON
20 CONTINUE
a contraction
C CONVERT DATA TO SAINFALL AMOUNTS FROM LODKUP TABLE
C
50 30 100 [31,119
SPATA(7) = SAIN(1DATA(1)=31)
100 CONTINUE
C
C HOUE SOU MUMBER INTO SEAL ARRAY
100000
DECODE(1.150.1DATA(120)) SDATA(120)
150 FORMAT/F1 0)
SETURN
FND
244
1
18
SUBSOUTINE SAINSH(IURAL, IUTEM, IUTSA, IAVEAL, IAVTEM, IAVTRA)
SUBSOUTINE RAINSM(IURAL, IUTEM, IUTRA, IAVRAL, IAVTEM, IAVTRA)
SURROUTINE SAINSM (IURAL, IUTEM, IUTSA, IAVRAL, IAVTEM, IAVTRA) C THIS SOUTINE SUMS THE CURRENT HOURS SAINFALL INTO THE TOTAL
SURROUTINE SAINSM (IURAL, IUTEM, IUTSA, IAVRAL, IAVTEM, IAVTRA) C THIS SOUTINE SUMS THE CURRENT HOURS SAINFALL INTO THE TOTAL
SUBSOUTINE RAINSM(IURAL, IUTEM, IUTRA, IAVRAL, IAVTEM, IAVTRA)

	TAUTEMAL
	- IAVTRA-1
	IAURAI=1
-0	
C UPT	DATE HEADER TO LATEST HOUR
	READ! IUTRA! IAUTRA: ERR=8000) HEADER
	READ! TURAT TAURAT ERR=8000 HEADER
	WRITE(TUTEM'TAUTEM.ERR=9000)HEADER
	DO 100 F=2.42
	READ (TUTRA TAUTRA FRESHOOD) TOTAL
	READ(TURAT TAURAT FRESHOOD) RAIN
	00 50 (=1.119
	TEMP(1)=TOTAL (1) +PAIN(1)
50	CONTINUE
	TEMP(120)=801N(120)
	URITE (TUTEN / TAUTEM - ERR - 9000) TEMP
100	CONTINUE
	· · · · · · · · · · · · · · · · · · ·
	TAUTEN
	TAUTRASI
	00 200 L=1.42
	SEAD (LUTEM / LAUTEM SER = 9000) TEMP
	URITE (TUTRA LAUTRA FERE 2000) TEMP
200	CONTINUE
	OFTUDA
-	RETURN
- G 85	AD ERROR WHILE SUMMING HOURS DATA AND TOTAL
G 85	
18 2000	AD ERROR WHILE SUMMING HOURS DATA AND TOTAL
	AD ERROR WHILE SUMMING HOURS DATA AND TOTAL WRITE(6,*)'*** ERROR READING FILE WHILE SUMMING HOURLY ',
18 2000	AD ERROR WHILE SUMMING HOURS DATA AND TOTAL WRITE(6,*)'*** ERROR READING FILE WHILE SUMMING HOURLY ', (RAINFALL - TERMINATED'
9000	AD ERROR WHILE SUMMING HOURS DATA AND TOTAL WRITE(6.*)'*** ERROR READING FILE WHILE SUMMING HOURLY '. 'RAINFALL - TERMINATED' GALL EXIT
9000	AD ERROR UMILE SUMMING HOURS DATA AND TOTAL
9000	AD ERROR WHILE SUMMING HOURS DATA AND TOTAL WRITE(6,*)'*** ERROR READING FILE WHILE SUMMING HOURLY', (RAINFALL - TERMINATED' GALL EXIT WRITE(6,*)'*** ERROR WRITING FILE WHILE SUMMING HOURLY', (RAINFALL - TERMINATED'
9000	AD ERROR WHILE SUMMING HOURS DATA AND TOTAL URITE(6,*)'*** ERROR READING FILE WHILE SUMMING HOURLY ', GALL EXIT URITE(6,*)'*** ERROR WRITING FILE WHILE SUMMING HOURLY ', 'RAINFALL - TEFMINATER' GALL EXIT
3000 11 10 10 10 10 10 10 10 10 10 10 10	AD ERROR WHILE SUMMING HOURS DATA AND TOTAL WRITE(6,*)'*** ERROR READING FILE WHILE SUMMING HOURLY', (RAINFALL - TERMINATED' GALL EXIT WRITE(6,*)'*** ERROR WRITING FILE WHILE SUMMING HOURLY', (RAINFALL - TERMINATED'
9000	AD ERROR WHILE SUMMING HOURS DATA AND TOTAL URITE(6,*)'*** ERROR READING FILE WHILE SUMMING HOURLY ', GALL EXIT URITE(6,*)'*** ERROR WRITING FILE WHILE SUMMING HOURLY ', 'RAINFALL - TEFMINATER' GALL EXIT
9000	AD ERROR WHILE SUMMING HOURS DATA AND TOTAL URITE(6,*)'*** ERROR READING FILE WHILE SUMMING HOURLY ', GALL EXIT URITE(6,*)'*** ERROR WRITING FILE WHILE SUMMING HOURLY ', 'RAINFALL - TEFMINATER' GALL EXIT

COMPUTER PROGRAM #2

PROGRAM MAIN
C4744444444444444444444444444444444444
G THIS IS THE MAIN DRIVER COUTINE FOR THE GUESALL
G RAINFALL ESTIMATE SYSTEM THIS COUTING COMPUTES
G THE INTERPOLATED RAIN AND ERROR MALUES FOR THE
G CONTROL STATIONS IN THE SYSTEM COMPUTES THE FIVE
G ESTIMATES (THE SATELLITE ALONE ESTIMATE IS READ FROM
C THE CATELLITE ESTIMATE FILE ASSUMED TO BE EXISTING
G PAIGE TO RUNNING THIS AGUTINE THE CILE MAY RE EMETY
C NOT AVAILABLE FOR THAT DAYS AND THETE ASSOCIATED
C TOTAL SERGES, DETERMINES UNICH OF THE SILE METHODS
C IS THE UTINER FOR THE DAY, AND CONFUTES THE FINAL
C PAINFALL ESTIMATE FOR THE DAY USING THE MINNING METHOD.
REAL SNDAT(120) FERNAT(120) STATN(18) RAIN(120) SATEST(120)
INTEGER ALLSTA(200.5)
LOGICAL*: ANG.TITLE(2A)
FOUTUAL FACE (STATA(A).G).(STATA(Z).G).(STATA(Z).GA).
* (STATN(S) GM) (STATN-10) (GM) (STATN(12) (ST)
C DEFINE STATEMENT SUNCTION TO COMPUTE CORSELATION CORFETCIENT
GGREL(N-6X-6X-6XY-5XSO-3XSO)-(N*5XY-5X*SY)/
C
DESK UNITED HANG - DYGIGTAGIL - TYPE - OLD - ACCESS - DISSOT
* RECORDSIZE 13 ASSOCIATEVARIARLE LANGTA HAXREC 200
GESNAUNIT-J. NAMS - DYOLTRAIN - TYPE- CLD - ACCESS - DIRECT -
* RECORDSTIZE - 130 - ASSOCIATEDAR ABLE - (AUGAT - HAYREC - 42)
URITE'S CENTER STORM DATE INFORMATION (UP TO 34 CHARACTERS)
SEAD(S.) TLS
- FORMAT(GOAL)
C FILL STATIONS REPORTING WITH ORS SATEST FOR OLS FLAG IF GAGES
NOT AVAIL OF SAT NOT AVAIL, STOP IF SOTH HOT AVAIL
11 127401 - 2
10 10 10 10
: CALL FILSTA(ISTAFL.ISATEL.ISAT.IGAGE) : URITE(5.*)(FILSTA COMPLETED) : SLOSE(UNIT-IGATEL)
INITE A TAKETI STA COME! ETTD!
LOSS (UNIT-ISATEL)
1 C CHEEK FOR NO GOGES TODAY
4-3
1 - IF-6/BAGE-9T-0/90-TO-1000
G GAGES PRESENT, SORT FOR INTERPOLATION
CALL SORT(ISTAFL ALLSTA)
HRITE(E.E)/SORT COMPLETED/
C CHECK FOR MG SAT FET AUATI
C CHECK THE SIT SAT EST AVAIL
IF(ISAT.GT.0)GR TR 2000
C .
C SAL AND GAGES SOTH AVAIL . COMPUTE VARIOUS COMBINATIONS
C COMPUTE INTERED ATER RAIN AND SERGE FOR CONTROL STATIONS
CALL INTERP(1.ISTAF) (0.ALLSTA)
URITE(E.x) (INTERS COMPLETED FOR RAIN AT CONTROLS'
CAL: INTERP(3, ISTAFL, 0, ALL STA)
WRITE(5.*)'INTERP COMPLETED FOR ERROR AT CONTROLS'
C COMPUTE CH.CA.CAM.CORRELATION SUMS.
AND ERROR SUMS FOR EACH AT CONTROL STA
C STATE STAT
F0=0.
50=0
FOATO.
FOMMO
FRAMEN.
- ENAMEN
FRAM=0. 3MORS=0. SSORS=0. SMO=0.
FRAM=0. SMORS=0. SMORO. SMORO.
FRAM=0. 3MORS=0. SSORS=0. SMO=0.

	SHI.=O.
	SSG=0.
	SHOAD.
	SS(ASO.
	20A0RS = 0.
	SHOH#O.
	SSOMEO
	SCHOPS-0
11	SHCAM=Q.
10	SSQAM=0.
,	50AH09=0.
•	00 100 T=1+300
, .	
- C CHE	CX FOR MORE STATIONS
÷ c	
	IF(ALLSTA(I-1) LT.0)G0 TD 200
	CV COL CONTROL STATEOU
	CK FOR CONTROL STATION
С	TEVALL CTAVE AND ME ANCE TO LOG
	IF(ALLSTA(I+4) NE-0)GD TO 100
	READ(ISTAFL (ID)STATN
	9M=(6+9)/2.0
	3A=9+67
- O-RAI	H ESTIMATE CANNOT BE NECATIVE
	IF (80.LT.0.0) 80-0.0
	OAM=(OA+G)/2.0
	WRITE(ISTAFL/ID)STATN ED=ED+ARS(DRS=Q)
	EG=EG+ABS(OBS-G)
	=00=500+025(025-00)
	EGM=EDM+A83(OBS-OM)
	ERAM=ERAM+ABS(OBS-CAH)
	N=N+1
	-SHOPS-SHOPS-OPS
	35085=S5085±085
	CX0=2X0+0
	-650~650+0*0 -500B5~500B5+0*0B5
	- SMG-SMC+G
	-230-530+G*G
	SGOBS-SGOBS+G*OBS
	- SHGA-GHGA-GA
	65QA=55QA+QA*QA
	SGAOBS=SGAOBS+GA*OBS
	SNON-ENGH-CN
	SCH-SCHIORS+OH*ORS
	- CHOAM-CHOAM-COM
	\$600X=6000X+00X+00X
	SGAMOR-SCAMOR+GAM*ORS
100	CONTINUE
	PUTE WINNER-FOR DAY
-	
	ISMALL 1
	- SMALL-EQ - IF (EG.GT. GMALL) GO TO 210
12	- IF COVER TO THE PROPERTY OF
11	SHALL =50
10 210	IF+E9A-/3T-9MALL)60 T9 220
•	I SMALL 3
, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	SHALL*EGA
220	IF(ER) GT GHALL)69 TO 230
1	- ISHALE -1
1 070	SHALL COM
1 230	IF CRAM-GT-SMALL+88 TO 240
1	STALL STALL
240	WRITE(5,241)TITLE
	WRITE(4.241) TITLE
241	FORMAT(1X,80A1)
	WRITE(5.*)/TOTAL OBSERVED RAINFALL AT CONTROL STATIONS - '.
	SHORS
	WRITE(4.+)/TOTAL ORSERVED RAINFALL AT CONTROL STATIONS = '.
	WRITE(5.*) (ABSOLUTE ERRORS FOR D.G.DA.DH.DAH # /
	WRITE(5.*) EQ.EG.EQA.EQK.EQAM

A Transfer
URITE(4.1)'ARSOLUTE ERRORS FOR 0.0.0A.OM.OAM = '
HEITE((, *)EO.EG.EGA.EGM.EGAM
WEITE(S.E) TOTAL ESTIMATES FOR O.G. GA. GM. GAM . "
WEITE(5.1)SHO.SHO.SHOA.SHOA.SHOAH
WEITE (A.E) SHO, SHO, SHOW, SHOW, SHOW
URITE(5.8)(ALGERRAIC FIRERS FOR D.G.CA.CH.CAM & '
HRTTE(5.1)SHO-SHORS.SHO-SHORS.SHOA-SHORS.SHOH-SHORS.
1 SMOAH-SMORS
WEITE (A. *) 'ALGEBRAIC FRENES FOR D. G. DA. OH. CAH Z '
URITE(A.*) SMO-SMORS, SMO-SMORS, SMOM-SMORS,
SHOAM-SHORS
C COMPUTE CORRELATION CORRESCOTENTS
CCO=CORFI (N.SHORS.SHO.SCORS.SSORS.SSO)
CCC*CORFI (N. SHORS, SHG. SGORS, SSORS, SSG)
CCCA=COSEL (N.SHORS.SHORS.SGORS.SSCRS.3SGA)
CTCH=COSEL(N,SMORS,SMORS,SCROSS,SSCM)
CEDAH-COREL (N. SHORS, SHORM, SOAHOR, SSORS, SSOAM)
WRITE(5.*)CCCC.CCCA.CCCA.CCCAM
WRITE (A. 1) CORRELATION COEFFICIENTS FOR Q.G.GA.GM.GAM = '
URITE/4.*\CCG.CCG.CCGA.CCGAM
WRITE(T.R) WINNER FRUND
MRITE(S.R) WANT IN PROCEED WITH FINAL ESTIMATE COMPUTATION?
SEAD(S. 20) ANS
350 FDSH4T(8041)
TE (ANS.NE. (HY) GO TO 2000
WRITE (TATE COMPUTING FINAL FRIENDS:
C GO IN THE WINNING METHOD FOR FINAL COMPUTATION
GD TD (1000-3000-1000-1000-5000).[SHALL
G GATELLITE ALONE IS WINNER (MAYDE NO GAGES FOR DAY)
1000 URITE(S.X) TATELLITE ALONE IS HIMMER!
* DECORDSITE - 130 ASSOCIATEMARIARIE = (AUSAT, MAYREC - 42)
. OPEN (UMIT = R. NAME = 'DYO : ROINEL . ', TYPE = 'OLD . ACCESS = 'DISECT'.
· CFECRESTIF - 170 ASSOCIATIVARIARI F - LAURAL MAYREE - 471
PATEL =8
IRAIFL as
IRAIFL as
C COPY SATEST TO RAIN FILE C DO-1100 I=1.42
C COPY SATEST TO RAIN FILE C C COPY SATEST TO RAIN FILE C C COPY SATEST TO RAIN FILE C C C C C C C C C C C C C C C C C C C
C COPY SATEST TO RAIN FILE C DO LLOG I=1.42 READ(ISATEL I) SATEST URITE(IRAIFL I) SATEST
C COPY SATEST TO RAIN FILE C C COPY SATEST TO RAIN FILE C C COPY SATEST TO RAIN FILE C C C C C C C C C C C C C C C C C C C
IRAIFLER C COPY SATEST TO RAIN FILE OO 1100 1=1.12 READ/ISATEST UPITE/ISATEST 1100 CONTINUE
C COPY SATEST TO RAIN FILE C DO LLOG I=1.42 READ(ISATEL'I) SATEST URITE(IRAIFL'I) SATEST
C COPY SATEST TO RAIN FILE C COPY SATEST TO FILE IN FINAL 2ST
IRAIFLER C COPY SATEST TO RAIN FILE OO 1100 1=1.12 READ/ISATEST UPITE/ISATEST 1100 CONTINUE
IRAIFLER C COPY SATEST TO RAIN FILE DO LLOG I=1.42 READ/ISATEL INSATEST UNITE(IRAIFL'INSATEST LIGO CONTINUE G CHESK FOR GAGES TO FILL IN FINAL SET IF IGAGE GT. ONGO TO LEGO
C COPY SATEST TO RAIN FILE C COPY SATEST TO FILE IN FINAL 2ST
IRAIFLER C COPY SATEST TO RAIN FILE DO LLOG I=1.42 READ/ISATEL INSATEST UNITE(IRAIFL'INSATEST LIGO CONTINUE G CHESK FOR GAGES TO FILL IN FINAL SET IF IGAGE GT. ONGO TO LEGO
IRAIFLES C COPY SATEST TO RAIN FILE DO 1100 121.42 READ/ISATEST UNITE/ISAIEL/INSATEST UNITE/ISAIEL/INSATEST ISOC CONTINUE G CHESK FOR GAGES TO FILL IN FINAL SET F/IGAGE GT. ONGO TO 1500 C GAGES RESIDT - BUT ORGUND TRUTH IN FINAL SET
IRAIFLES C COPY SATEST TO RAIN FILE OU LLOO INLINE READ(ISATEL') SATEST URITE(IRAIEL') SATEST LLOO CONTINUE C CHESK FOR GAGES TO FILL IN FINAL SET IF IGAGE GT. ONGO TO LEOO C GAGES PRESENT. BUT GROWN TRUTH IN FINAL SET CALL GNOTHU (STAFL LEALEL ALISTA)
TRAIFLES C COPY SATEST TO RAIN FILE DO 1100 121.12 READ(13ATE)(1)SATEST UPITE(18ATE)(1)SATEST UPITE(18ATEST)(1)SATEST UPITE(
IRAIFLES C COPY SATEST TO RAIN FILE DO 1100 121.42 READ(13ATEL 1) SATEST UNITE(18ATEL 1) SATEST UNITE(18ATEL 1) SATEST G CHESK FOR GAGES TO FILL IN FINAL SET G CHESK FOR GAGES TO FILL IN FINAL SET G CALL GNOTHLISTAFL IRAIFL ALISTA CO CLOSE (UNITALSATEL) CLOSE (UNITALSATEL) CLOSE (UNITALSATEL) UNITE(A.*) SATELLIFE ALONE METHOD IS WINNER TODAY.
TRAIFLES C COPY SATEST TO RAIN FILE DO 1100 121.12 READ(13ATE)(1)SATEST UPITE(18ATE)(1)SATEST UPITE(18ATEST)(1)SATEST UPITE(
I C COPY SATEST TO RAIN FILE C COPY SATEST TO RAIN FILE DO 1:00 1:1:1:2 READLIGATE: () SATEST URITE(IRAIFL') SATEST 1:00 CONTINUE G CHESK FOR GASES TO FILL IN FINAL TET G IF'IGAGE GT. 0:00 TO 1:00 G CAGES PRESENT - BUT CROWND TRUTH IN FINAL EST G CALL GNOTBU(ISTAFL : PATEL ALISTA) 1:500 CLOSE(UNITAISATEL) CLOSE(UNITAISATEL) CLOSE(UNITAISATEL) URITE(A.X) SAFELLIF ALONE METHOD IS WINNER TODAY: GO TO 7000
IRAIFLES C COPY SATEST TO RAIN FILE DO 1100 121.42 READ(13ATEL 1) SATEST UNITE(18ATEL 1) SATEST UNITE(18ATEL 1) SATEST G CHESK FOR GAGES TO FILL IN FINAL SET G CHESK FOR GAGES TO FILL IN FINAL SET G CALL GNOTHLISTAFL IRAIFL ALISTA CO CLOSE (UNITALSATEL) CLOSE (UNITALSATEL) CLOSE (UNITALSATEL) UNITE(A.*) SATELLIFE ALONE METHOD IS WINNER TODAY.
I C COPY SATEST TO RAIN FILE C CALL GRAPEST TO FILL IN SINAL SET C CHESK FOR GASES TO FILL IN SINAL SET C CALL GRAPEST FOR LIVE ORGUND TRUTH IN SINAL SET C CALL GRAPEST FILE (RAIS) CLOSE (UNITALISATE) C GAGES CNI Y HINNER (MAYSE NO SAT EST AUAIL)
C COPY SATEST TO RAIN FILE OC LIOO LELLAR READ(13ATEL 1) SATEST URLIT(18ATEL 1) SATEST LLOO CONTINUE C CHECK FOR GAGES TO FILL IN FINAL SET IF (1GAGE GT. 0) GO TO LEOO C GAGES RESENT . BUT ORGUND TRUTH IN FINAL EST C CALL GNOTRU(ISTAEL 18ATEL 18 TA) CLOSE (UNITSISTEEL) CLOSE (UNITSISTEEL) URLITE (A.EL) SATEST IN GAME HETHOD IS UINNER TODAY TO TO ROOO C GAGES ONLY HINNER (MAYRE NO SAT EST AUALL) C GAGES ONLY HINNER (MAYRE NO SAT EST AUALL)
TRAIFLES C COPY SATEST TO RAIN FILE DO 1100 I=1,12 READ/ISATEL/INGAIRST URITE/IRAIFL/INGAIRST URITE/IRAIFL/INGAIRST URITE/IRAIFL/INGAIRST S CHESK FOR GAGES TO FILL IN FINAL SET C IF/IGAGE GT. ONGO TO 1500 G GAGES RRESENT - RUT GROUND TRUTH IN FINAL SET CALL GNOTHU/ISTAFL ARAIFL ALL STA) CLOSE/UNIT=(RAIFL) CLOSE/U
C COPY SATEST TO RAIN FILE OC LIOO LELLAR READ(13ATEL 1) SATEST URLIT(18ATEL 1) SATEST LLOO CONTINUE C CHECK FOR GAGES TO FILL IN FINAL SET IF (1GAGE GT. 0) GO TO LEOO C GAGES RESENT . BUT ORGUND TRUTH IN FINAL EST C CALL GNOTRU(ISTAEL 18ATEL 18 TA) CLOSE (UNITSISTEEL) CLOSE (UNITSISTEEL) URLITE (A.EL) SATEST IN GAME HETHOD IS UINNER TODAY TO TO ROOO C GAGES ONLY HINNER (MAYRE NO SAT EST AUALL) C GAGES ONLY HINNER (MAYRE NO SAT EST AUALL)
I RAIFLES C COPY SATEST TO RAIN FILE C COPY SATEST TO RAIN FILE C COPY SATEST TO RAIN FILE C CALL GARREL (1) SATEST (1) O CONTINUE G CHESK FOR GARGE TO FILL IN FINAL SET (2) IF (1) CARCE OF A LONG TO LEGO C CALL GARDENIN (STAFL (1) SATEST A) (3) CLOSE (UNITSISTAFL) CLOSE (UNITSISTAFL) CLOSE (UNITSISTAFL) CLOSE (UNITSISTAFL) CLOSE (UNITSISTAFL) CLOSE (UNITSISTAFL) C GARGES ONLY HINMER (HAYSE NO SATEST AVAIL)
C COPY SATEST TO RAIN FILE C COPY SATEST TO RAIN FILE DO 1:00 1:1.12 READ(13:TEL.1) SATEST URITE(18AIFL'1) SATEST URITE(18AIFL'1) SATEST URITE(18AIFL'1) SATEST URITE(18AIFL'1) SATEST URITE(18AIFL'1) SATEST G CHESK FOR SAGES TO FILL IN FINAL SET G GAGES RESENT - BUT ORGUND ISUTH IN SINAL SET CALL GUNTRU(1STAFL IRAIEL) CLOSE(UNITALSAIFL) CLOSE(UNITALSAIFL) CLOSE(UNITALSAIFL) URITE(18AI) SATEST LITE ALONE HETHOD IS HINNER TODAY' WO TO ROOM G GAGES ONLY HINNER (MAYSE NO SATEST AUAIL) CO GAGES ONLY HINNER (MAYSE NO SATEST AUAIL) C GAGES ONLY HINNER (MAYSE NO SATEST AUAIL)
C COPY SATEST TO RAIN FILE C COPY SATEST TO RAIN FILE DO 1:00 [21.42] READ(137FL.1) SATEST URITE(1RAIFL'1) SATEST URITE(1RAIFL'1) SATEST URITE(1RAIFL'1) SATEST G CHECK FOR SACES FO FILL IN FINAL SET F'(18AGE ST. 2) SO TO 1:00 G CAGES RESENT . EUT ORGUND FRUTH IN FINAL FST CALL GNOTPH(1STAFL) FRAIE (AL STA) CO CASE(HNIT=1SATE)) CLOSE(HNIT=1SATE)) URITE(A.F) SATEST ITE ALONE HETHOD 'S HINNER TODAY' TO TO 3000 G CAGES ONLY HINNER (MAYSE NO SATEST AUGIL) CO CAGES ONLY HINNER (MAYSE NO SATEST AUGIL) C CAGES ONLY HINNER (MAYSE NO SATEST AUGIL) C CAGES ONLY HINNER ALONE IS HINNER: C CAGES ONLY HINNER ALONE ALO
TRAIFLES C COPY SATEST TO RAIN FILE C CALL CONTINUE C CHESK FOR SASES TO FILL IN FINAL SET C CALL CONTINUE C CAGES RESENT . BUT CROWN TRUTH IN STAM SET C CALL CONTINUESCATE . PROTEIN TRUTH IN STAM SET C CALL CONTINUESCATE . C CAGES RESENT . BUT CROWN TRUTH IN STAM SET C CALL CONTINUESCATE . C CAGES RESENT . BUT CROWN TRUTH IN STAM SET C CALL CONTINUESCATE . C CAGES RESENT . BUT CROWN TRUTH IN STAM SET C CAGES CONTINUESCATE . C C CAGES CONTINUESCATE . C C CAGES CONTY WINNER (MAYSE NO SAT EST AVAIL) C C CAGES CONTY WINNER (MAYSE NO SAT EST AVAIL) C C CAGES CONTY WINNER (MAYSE NO SAT EST AVAIL) C C CONTROL CONTR
C COPY SATEST TO RAIN FILE C COPY SATEST TO RAIN FILE DO 1:00 [21.42] READ(137FL.1) SATEST URITE(1RAIFL'1) SATEST URITE(1RAIFL'1) SATEST URITE(1RAIFL'1) SATEST G CHECK FOR SACES FO FILL IN FINAL SET F'(18AGE ST. 2) SO TO 1:00 G CAGES RESENT . EUT ORGUND FRUTH IN FINAL FST CALL GNOTPH(1STAFL) FRAIE (AL STA) CO CASE(HNIT=1SATE)) CLOSE(HNIT=1SATE)) URITE(A.F) SATEST ITE ALONE HETHOD 'S HINNER TODAY' TO TO 3000 G CAGES ONLY HINNER (MAYSE NO SATEST AUGIL) CO CAGES ONLY HINNER (MAYSE NO SATEST AUGIL) C CAGES ONLY HINNER (MAYSE NO SATEST AUGIL) C CAGES ONLY HINNER ALONE IS HINNER: C CAGES ONLY HINNER ALONE ALO
IRAIELES C
IRAIELES COPY SATEST TO RAIN FILE COUNTY SATEST TO PRINCIPAL TO SATEST TO
IRAIELES C
I C COPY SATEST TO RAIN FILE OC 1100 1:1.42 READ: 13ATE, /1:RATEST UPITE: (RAIL /1:RAIL /
TRAIFLES C COPY SATEST TO RAIN FILE DO 1100 IMILES READISATELLIST HEITSTEAMS TO SAIN FILE C CONTINUE G CHESK FOR SAGES TO FILL IN FINAL SET 1//1006 ST 0/00 ID 1500 G GAGES ARRESHY . BUT ORDING TRUTH IN SINAL SET CALL GARRENITATIONAL FRAIFL ALL STA FOO CLOSE (HANTALSTAFL) CLOSE (HANTALSTAFL) C FAGES GALV HANDER (HAYSE NO SAI EST AUAIL) C FAGES GALV HANDER (HAYSE NO SAI EST AUAIL) C FAGES CALL SAINE FIELD USING ALL STATIONS C FATER FOR SATIRE FIELD USING ALL STATIONS C FATER FOR SATIRE FIELD USING ALL STATIONS C FATER FOR SATIRE FIELD USING ALL STATIONS C FACES CODE HERE TO GET DATE ON FINAL SILE C CLOSE (HANTALSTAFL)
TRAIFLES C COPY SATEST TO RAIN FILE DO 1100 I=1.12 READ ISATE; I SATEST UDITY PARTET LUCO CONTINUE C CHECK FOR SAGES TO FILL IN FINAL EST IF (IGAGE GT. ANGE TO 1500 C CAGES RESSENT. RUT CROUND TRUTH IN FINAL EST C CALL SUBSTILICISTAFI (REALE). CLOSE (UNITALISATE). C SAGES GNI Y HINNER (HAYSE NO SAT EST AUAI). C GAGES GNI Y HINNER (HAYSE NO SAT EST AUAI). C GAGES GNI Y HINNER (HAYSE NO SAT EST AUAI). C GAGES GNI Y HINNER (HAYSE NO SAT EST AUAI). C GAGES GNI Y HINNER (HAYSE NO SAT EST AUAI). C GAGES GNI Y HINNER (HAYSE NO SAT EST AUAI). C GAGES GNI Y HINNER (HAYSE NO SAT EST AUAI). C GAGES GNI Y HINNER (HAYSE NO SAT EST AUAI). C GAGES GNI Y HINNER (HAYSE NO SAT EST AUAI). C GAGES GNI Y HINNER (HAYSE NO SAT EST AUAI). C GAGES GNI Y HINNER (HAYSE NO SAT EST AUAI). C JOSE (UNITALISATE). C NEED CODE HERE GO GET DATE ON FINAL FILE C GOSE (UNITALISATE). C SOSC (UNITALISATE).

OF POOR QUALITY

January Control of the Control of th
C OA (SATELLITE ADJUSTED) IS WINNER
" TANA UNITED TO THE PARTY OF T
" SATELLITE ANJUSTED IS UTHNER!
* RECORDGIZE-120-AGGOGIATEVARIABLE-IAVGAT.MAXPEC-12)
* RECORDSIZE-120-ASSOCIATEUARIABLE-IAUERF.MAXREC-42)
* OFEN(UNIT-0.NAME-'DYO:RAINFL.'.TYPE-'OLD'.ACCESS-'DIRECT', * RECORDSIZE-120-ASSOCIATEVARIABLE-IAVRAI.MAXREC-12) * O INTERP FOR ENTIRE FIELD ERROR (ODG GAT EGT) USING ALL STATIONS
- * RECORDSIZE-130-ASSOCIATEVARIABLE-IAVRAI-MAXREC-12)
C THEFT OF CHILD STELL STORE (ORS CAT SET) HETHER ALL STATIONS
I IERFFL-?
IRAIFL=8
CALL INTERP(4.ISTAFL.IERFFL.ALLSTA)
C THE CONTROL OF THE
C ADD ERROR FILE TO SAT EST FILE
C
READ(ISAIE) (1) SAIEST
WRITE (IRAIEL (1) SATEST
DO 3100 1=2.42
SEAD(ISAIEL'I)SAIESI
SEAD(TEREFL'T)ERDAT
00 3050 (=1,119
SAIN(_I) =SAIFST(_I) +FROAT(_I)
3050 CONTINUE
RAIN(170)=SAIFSI(170)
HRITE(IRAIFL'I)RAIN
3100 CONTINUE
CLOSE (UNITALSATEL)
CLOSE (UNIT=ISTAFL)
CLOSE (UNIT=IEREFI)
CLOSE (UNIT=IRATEL)
WRITE(A.*) SATELLITE ADJUSTED METHOD IS MUNNER TODAY!
GO TO 2000
C OM (MEAN OF SAT EST AND INTERP RAIN FIFED) IS WINNER
C
4000 WRITE(5.1) MEAN OF SAT AND GAGES IS WINNER!
<pre>OPEN(UNIT=3,NAME='DYO:TRAIN,',TYPE='OLD',ACCESS='DIRECT',</pre>
* RECORDSIZE=120.ASSOCIATEVARIABLE=1AVSAT.MAXREC=42)
OPEN(UNIT=4.NAME='DYO:RNEILE.'.TYPE='GLD'.ACCESS='DIRECT'.
* RECORDSIZE=120,ASSOCIATEVARIABLE=[AVRNE,MAXEEC=42)
OPEN(UNITER.WAME='DYO:RAINEL'.IYPE='OLD'.ACCESS='DIRECT'.
* RECORDSIZE=120.ASSOCIATEVARIABLE=[AVRAI, MAXREC=42)
IRNFFI ad
IRAIFL #8
C INTERP FOR RAIN OVER ENTIRE FIELD USING ALL STATIONS
CALL INTERP(3, ISTAFL (IRNEFL, ALLSTA)
C COMPUTE OM = (RAIN+SAIEST)/2.0 AND STORE ON FINGL FILE
II DEAD TRATEL (1) CATED
OCHILL CHILCH LIGHTCOL
1 DO 4100 [=3.42
- ALAUL 3416 - 134163
SEAD (IRNEFL/ I) SHIPAT
SAIN())=(RNDAT())+SATEST()))/2-0
) DATULIDA - CATERTILIDA :
ARITE (TRAIF) / LINEAUN
4100 CONTINUE
TIO CONTINUE
C SUI GEGUND TRUTH IN FINAL
5
CALL GNDTRU(ISTAFL - IRAIFL - ALISTA)
CLOSE (UNITALISTAEL)
CLOSE (UNIT-LEATEL)
CLOSE (UNIT-IRNEEL)
CLOSE (UNIT-IRAIFL)
URITE (4. 4) 'HEAN OF SATELLITE AND CAGES IS WINNER TODAY'
GO TO 2000
C
C DAM (MEAN OF DA AND GAGE INTERS CIEI D) 13 WINNES
SOOD WRITE(5.*) MEAN OF SAT ADJUSTED AND GAGES IS WINNER!
OPEN(UNIT=1.NAME='DYO'TRAIN,'.TYPE='OLD'.ACCESS='DIRECT'.

	SECORDST7F#170.ASSOCIATEVARTARLE#IAUSAT.HAYREC#47)
	OPEN(INTTEA, NAME = TYO : RNET! E, ', TYPE = 'O! D', ACCESSE 'DIRECT'.
	PECORDETTE-120-ASSOCIATEMARIARI E-TAMBHE - MAYSEC-42)
	GRENCIDITES NAME - DYO FRETIE . TYPE- OLD . ACCESS- DIRECT.
	RECORDS ITE 170. ASSOCIATEURE (ABLE = LAUERE . HAYREC #42)
	I PNET LA
	IEREFI = 2
C THE	ERR FOR PAIN ALL STATIONS AND FOR FREDR ALL STATIONS
	CALL INTERPITATION TRNEF ALLISTA
	CALL INTERP(4.ISTAFL.IERFFL.ALLSTA)
	CLOSE (UNIT=ISTAFL)
C	
C COM	FUTE CAM = (SAIN + FEROR + SATEST)/2.0
	FILE THE BURNET SHIP F SHIPS III
	OPEN (UNITES NAME = DYO SAINFI . ', TYPE = 'DI D', ACCESSE'DIRECT'.
	SECORDSITE 120. ASSOCIATEVARIABLE 1008AL MAXREC 42)
	TRATEL #8
	SEAR(ISATEL /1) SATEST
	URITT/IRAISL/1)SATEST
	DO 5100 Is2.42
	SEAD (TSATE) (T) SATEST
	SEAD (TRIMET) (T) SUDAT
11	
THE RESERVE OF THE PERSON NAMED IN COLUMN 2 IS NOT THE PERSON NAME	READ(IEREFL'I)ERDAT
11	00 5050 :=1.117
10	FAIN()) = (TATEST()) + FMDAT()) + FRDAT()) \ /2 C
, 5050	PONTINUE
1 5050	PAIN(100)=PAIN(100)
,	
	HRITE/IPAIEL/INFAIM
	CONTINUE
1	CLOSE (UNIT-ISATEL)
	CLOSE (LIMET - FRANCE)
1	
	CLOSE (UNIT=IEREFL)
	CLOSE (UNIT = IRAIFL)
	WRITE(6.*) MEAN OF SATELLITE ADJUSTED AND GAGES IS WINNER TODAY
	The state of the s
2	W-144.7=
	XINATE
2000	CALL SXIT
-	THO .
	CUCROLITING OUR TRUCKSTAFT, ISANEL ALL STAN
	I ROUTING RESTORES THE GAGE EXACTNOS TO THE
	NAL ESTIMATE FILE GAGE READINGS ARE ALHAYS
	ED NO MATTER UNICH METHOD IS DAYS HINNER

-	
	REAL STATM(18) FAIM(120)
	INTEGER ALL STACTORES
	EQUIVALENCE (STATM(E).ORS)
	Ta!
-	
	
- CHI	FEX FOR LAST STATION
100	IF (ALL STA(I-1) (I O)SETURN
	MCCL =ALL STA(I. I)
	NECU-ALLSTACE-3)
	ID-ALLSTA(I-1)
	SEARCHSTAFI (ID) STATE
	RAIN(NCCL)-OPE
	URITE (IRAIFL AROU-33) SAIN
	- I-I+1
	-00-79-100
	SNP .
1	
11	
11	
11	

ORIGINAL PAGE IN

SUBROUTINE FILSTACISTAEL ISATEL ISAT LIGAGE)
C*************************************
C THIS POUTING FILLS REPORTING STATIONS WITH OBS.SAT EST.
C FRE G-S-FLAGS ON/OFF. FLAGS FOR NO SATELLITE OR NO GAGES
C OR MEITHER (MHEN MEITHER - TERMINATES).
C*************************************
EAL STAIN(18).SATEST(120)
OGICAL*1 ANS
LOGICAL*1 ISTATN(8). IONOFF
FOULUAL ENCE (STATN(1), ISTATN(1)), (STATN(5), OBS), (STATN(A), O), (STATN(1), EGS), (ISTATN(A), IONOFF), (ISTATN(5), IROW),
(ISTATN(7)-ICOL)
MXROUS 75
MNEOUSIS
HYCOL =112
MNCOL =1
HRITE(5.*) ARE ANY STATIGHS AVAILABLE TODAY (Y OR N)?
READ(5.1)ANS
1 FORHAT(80A1)
I GAGE = 0
IF (ANS NE 'Y') IGAGE=1
WRITE(5.1. IS THE SAIFLLITE ESTIMATE AVAILABLE TODAY (Y OR N)?"
READ(5-1)ANS
LSAT=0
IF(ANS.NE.'Y') ISATEL
a cuery see also also
C CHECK FOR GAGE AVAIL
IF(IGAGE.LT.1)GO TO 100
C CHECK FOR SAT ONLY
- G
IF4 ISAT -LT - LYRSTURN
C
- C BOTH MISSING TERMINATE
II C INC. THE CONTROL OF THE CONTROL
WALTE (- T) MELTHER SATELLITE NOR GAGES AVAILABLE - TERMINATE
CANA EXIT
C GET GAGE READINGS
TOO WHITE STATE HAVE ANY AVAILABLE STATIONS BEEN ENTERED ALREADY?
ACADIE LANG
, 11 (ANO)-CATINTOO 10 100
IONOFF=0
HRITE(ISTAEL'I)STAIN
150 CONTINUE
GO TO 120
160 URITE(5.*) HAVE ALL AVAILABLE STATIONS BEEN ENTERED?
READ(S.1)ANS
IF (ANS. FR. 1HY) GR. TR. 400
C
C ENTER STATION READINGS IN ANY DEDER
C
190 WRITE(5.*) BEGIN ENTERING STATION OBSERVATIONS, TYPE -1.0 TO STOP
200 WRITE(5,*)'ENTER STATION ID AND OBSERVED VALUE AS ID, NNN, DD'
SEAD(5.*)ID.ORSUD
IE(ID. I.0)GO ID 500
IF(ID,LE,200)GD TO 210
GO TO 200
210 READ(ISTAFL'ID)STAIN
TOWNER = 1
ORS#ORSUD
C
C CHECK FOR SATELLIFE TOO
JE(JSAI, GI, Q) GQ TQ 300
IECTEON OF HYPON OR IRON IT HARDWIGO TO 240
TECTOR LE HATCH AND TOOL GE HACH IGO TO 250
240 LONGEFEO
GO TO 300
250 SEAD(ISATEL/ISOM-33)SAIFST
R=SATEST(120L)
EGS=GRSUD=G
300 WRITE(ISTAFL'ID)STATM

OF POOR QUALITY

GO TO 200
400 METTE(5.1) HAVE SATELLITE ESTIMATES BEEN ENTERED ALREADY?
TE(ANS.ER. 1HY) GR. TR. 500
C
C READ IN AND STORE SATELLITE ESTIMATES FOR EACH REPORTING STATION
C
DO 450 E=1 -200
READ/YSTATU TISTATU
IDE/STATN(!)
FIRST TO AND TO SOO
· IF(IROW.GT.HYROW.OR.IROW.LT.HUROW)GO TO 410
TEXTOOL IS HYCOL AND TOOL OF HHCOL AND TO ADD
ALO TOMOFF 30
G0 T0 440
A20 SEAD(ISATEL/ISCU-IT)SATEST
GESATEST (ICOL)
440 WRITE(ISTAFL'I)STATN
AND CONTINUE
C CHECK FOR ANY ERRONEOUS STATIONS
500 URITE(5.8) WANT TO CHANGE STATUS OF ANY STATION SECH ESPORTING TO
URITE(S. *) MOT REPORTING FOR THIS STORM?
READ(S-1)ANS
FIG. HRITE'S AVENTER ID OF STATION TO BE REMOVED FROM REPORTING!
URITE/S. MY STATUS (- 1 TO STOR) /
SEADLE, SALD
15(12 LT 0)50 TO 550
SEAD(ISTAFL (10)STAIN
13495740
HRITE/ISTAFL / IDNSTATM
00 TO 510
G CHECK FOR CORRECTION ENTRIES.
SEADIS-ILANS
15: ANS 53 14Y 00 TO 180
URITE SAR YOU WANT TO CONTINUE WITH RAINFALL ESTIMATION?
TEARCELLANS
IF CANS NE LHY)CALL EXIT
FND
19
1
1
1
1
CURROLITING CORT. VETACL
SUBSCRIPTINE SORT(ISTAFL ALLSTA)
THIS COUTINE CORTS THE REPORTING STATIONS BY COLUMN
C INTO THE ALLSTA AGRAY USING A BURBLE SORT
C INTO THE ALLSTA AGRAY USING A BURRLE SORT
C INTO THE ALL STA AGRAY HISING A BURBLE SORT CHARACTER STATE (19)
C INTO THE DISTA ASSAY HISING A SHERLE SORT CHIRALITATION AND AND AND AND AND AND AND AND AND AN
C INTO THE DISTA ASSAY USING A BURBLE SORT C SEAL STATULES LOGICAL 1 ICA. LONGEF. ISTATU(R) INTEGER ALLSTA (200.5)
C INTO THE ALISTA AGRAY USING A BURBLE SORT CHIMMAN AND AND AND AND AND AND AND AND AND A
C INTO THE ALISTA AGRAY USING A BURRLE SORT CHINALISM STATEM STA
C INTO THE ALISTA AGRAY USING A BURRLE SORT CHIMMAN AND AND AND AND AND AND AND AND AND A



С	
N-A	
DO 100 T=1,200	
READ(ISTAFL'I)STATN	,
IF(ID, IT, Q)GD TD 290	
TECTONOFF.FD.O.)GOTO 100	
N≥N+1	
ALL STA(N-1)=ID	
A(I STA(N.2)=IROU	
ALI STA(N+3)=TCOL	
100 CONTINUE	
C Wattan	
C SORT ARRAY	
200 ALISTA(N+1-1)=-1	
C BURBLE SORT. ASSUME SORTED ALREADY	
L I=N	
300 ISORI=1	
00 400 T=2	
K#I-1	
15 IF(ALLSTA(K.3) T.ALLSTA(I.3))G0 TO 400	
C SWITCH ENTRIES	
10 ISORT=0	
' ITEM=ALLSTA(K.N) ' ALLSTA(K.N)=ALLSTA(I.N)	
· ALLSTA(IAN)=ITEM	
1 350 CONTINUE	
400 CONTINUE	
1 IF(ISORT.NE.0)GD TO 500	
I ISORT#1	
J=J-1	
C ARRAY IS SORTED	
500 RETURN	
END	
11	
11	
11	
19 19	
11 19 1	
11	
11 19 19 19 19 19 19 19	
11	
11 19 19 19 19 19 19 19	
11	
11	
11	
11 10 10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
SUBROUTINE INTERP(IOPT.IST L.INFILE.ALLSTA)	
GURROUTINE INTERP(ICRT.IST INFILE.ALISTA)	
SUBROUTINE INTERP(IOPT.IST L.INFILE.ALLSTA)	
SURROUTINE INTERP(ICPT.IST L.INFILE.ALLSTA) CONTROLLINE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CONTROL STATION FOR THE PROLE STATION FOR THE PROLET FOR THE PROLET FOR THE PROLET FOR THE PROLET FOR THE PROLE	
SUBROUTINE INTERP(IOPT.IST L.INFILE.ALISTA) CONTROLLINE INTERP(IOPT.IST L.INFILE.ALISTA) CONTROLLINE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CONTROLLINE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CONTROLLINE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CONTROLLINE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CONTROLLINE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CONTROLLINE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CONTROLLINE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CONTROLLINE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CONTROLLINE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CONTROLLINE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CONTROLLINE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CONTROLLINE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CONTROLLINE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CONTROLLINE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CONTROLLINE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CONTROLLINE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CONTROLLINE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS	
SURROUTINE INTERP(ICPT.IST L.INFILE.ALLSTA) CONTROLLINE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CONTROL STATION FOR THE PROLE STATION FOR THE PROLET FOR THE PROLET FOR THE PROLET FOR THE PROLET FOR THE PROLE	
SUBROUTINE INTERP(IDET.IST L.INFILE.ALISTA) CONTROLLINE INTERP(IDET.IST L.INFILE.ALISTA) CONTROLLINE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CONTROL STATI	
GURROUTINE INTERP(IORT.IST L.INFILE.ALISTA) CTATALLEST TO THE ROUTINE INTERPOLATES FOR RAIN OR ERROR AL CONTROL STATIONS C THIS ROUTINE INTERPOLATES FOR RAIN OR ERROR AL CONTROL STATIONS C ONLY (IOPT=1 OR 2) OR FOR ENTIRE STATE FIELD (IOPT=1 OR 4). C THE FORMULA USED IS RASED ON WEIGHTED INFILIENCE OF INVERSE C OF DISTANCE SOURCED FOR NEARRY STATIONS. CTATALLEST TROUTED STATIONS.	
SURROUTINE INTERP(ICPT.IST L.INFTLE.ALLSTA) CONTROLLINE INTERPOLATES FOR RAIN OR ERROR ALCONTROL STATIONS CONTROLLINE SOURCED FOR NEARRY STATIONS. CHARACTERISTICATION OF THE PROPERTY STATIONS.	
GURROUTINE INTERP(IORT.IST L.INFILE.ALISTA) CTATALLEST TO THE ROUTINE INTERPOLATES FOR RAIN OR ERROR AL CONTROL STATIONS C THIS ROUTINE INTERPOLATES FOR RAIN OR ERROR AL CONTROL STATIONS C ONLY (IOPT=1 OR 2) OR FOR ENTIRE STATE FIELD (IOPT=1 OR 4). C THE FORMULA USED IS RASED ON WEIGHTED INFILIENCE OF INVERSE C OF DISTANCE SOURCED FOR NEARRY STATIONS. CTATALLEST TROUTED STATIONS.	
SURROUTINE INTERP(ICRT.IST L.INFILE.ALISTA) CHARACTURE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CHARACTURE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CHARACTURE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CHARACTURE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CHARACTURE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS CHARACTURE SCHARED FOR NEARRY STATIONS.	
SURROUTINE INTERP(ICET.IST L.INETLE.ALISTA) CHARLEST AND THE INTERPOLATES FOR RAIN OR ERROR AT CONTROL STATIONS COMMY (ICET-1 OR 2) OR FOR ENTIRE STATE FIELD (ICET-1 OR 4) COMMY (ICET-1 OR 4)	

C CONTROL ONLY, SET WORD FOR RAIN ON FREDRIFERRORS (FREDRIFERS)
C
run=7
TE(TOPI_GT_1) TWD#12
C GET NEXT CONTROL STATION
C
100 CALL NXTENT(IDET.NROW.NCOL.NSTA.AI STA)
C CHECK FOR LAST ONE
TE/NETA I.T. O)SETUEM
• FFAD(TSTAFL 'NSTA)STATM
CALL SAMSE LIDET, MEDIL, NCOL, ISTRI, MONE, ALL STA, LEMMPT, LEMMET,
THNPT.IMAPT.NPSF.NMAY)
C CHECK FOR MO INSTITENCE
C CHECK FOR MO INELLIENCE
IF CHONE GT - 01GO TO 200
CALL WEIGHT (TOPT, NEGW , NCOL , RNER, ALL STA , IRMNPT, IPHXPT,
I THART, THYRT, ARRE, AMAY, ISTAEL)
II STATN(TUD) ESNET
11 00 70 700
C NO INCLUENCE, SET TO SEED
' C NO INFLUENCE, SET TO SEPO.
' COO STATINGTUDING A
7 200 37479/2020 0
TOO UPTTY TOTAEL (NOTAIN
' GO TO 100
· C
C INTERCLATE FOR ENTIRE FIELD USING ALL STATIONS
1 -
1000 00 1100 [=2,42
URITE (INFILE (1) TERO
1100 CONTINUE
NEGU=34
1200 MEQUENECUEL
TEADLINETLE WAGU 33) BATA
1300 CALL HYTENT (TOPT - NEGU - NGTA - ALL STA)
1300 CALL HXTPHT (IDFT, NRCH, NCCL, NGTA, ALLSTA)
- 1300 - CALL MXTRNT (IGRT, MRCH, MCCL, MGTA, ALLGTA) - C - GHECK FOR LAST COL IN ROW
1500 CALL NXTRNT (TOPT , NRCH , NCCL , NSTA , ALL STA)
C CHECK FOR LAST COL IN ROW C STECK FOR LAST
C CHECK FOR LAST COL IN ROW
S CHECK FOR LAST COL IN ROW C CHECK FOR LAST COL IN ROW C IF (NCOL LT. 0) GO. TO 1300 C ROW NOT COMPLETE. COMPUTE INTERP. FOR ROINT
1300 CALL MXTENT/ 10FT, MEGU, MCCL, MSTA, ALLSTA) C CHECK FOR LAST COL IN ROW C IF (MCGL_LT, 0)GG_TG_1300 C ROW MOT COMPLETE, COMPUTE INTERP FOR ROINT C CALL RANGE (10FT, MCGL, MCGL, MSTAT, MGME, ALLSTA, MEMBET, MEMMET.
S CHECK FOR LAST COL IN ROW C CHECK FOR LAST COL IN ROW C IF (NCOL LT. 0) GO. TO 1300 C ROW NOT COMPLETE. COMPUTE INTERP. FOR ROINT
1300 CALL NXTENT (IDET, NEGL, NCC), NGTA, ALLSTA) C CHECK FIR LAST COL IN ROU C FIGURE LT 0.000 TO 1300 C ROU NOT COMPLETE, COMPLETE INTERE FOR ROINT C CALL RANGE (IDET, NEGL, NCC), 13TET, NONE, ALL STA, 12MNET, 12MYET. I MNET, 1MYET, NEGE, NHAY)
THE CALL NATERITIES AND
CALL NATERT FOR FORM COLUNCIAL NETA ALLSTA C CHECK FOR LAST COL IN ROW F (NCOL LT. 0)GO TO 1300 F ROW NOT COMPLETE, COMPUTE INTERP FOR ROINT C CALL RANGE (TOPT, NEON, NCOL, ISTRI, NONE, ALL STA, ISMNET, ISMYET, I THIRT, IMARE, NERF, NHAY) C CHECK FOR ROINT COLUCIDENT WITH STATION
THE CALL NATERITIES AND
CALL NATERITIEST NEGLINGS NATA ALLSTA CHECK FOR LAST COL IN ROW FENCOL LT. OUGO TO 1300 ROW NOT COMMIST. COMMUTE INTERS FOR SOINT CALL SAMSE LIGHT, NEGLINGS 1 STRILLIONS, ALLSTALISMNST, ISMNST, ISMN
IF (ISTER, GT. G) GG. IG. 1400.
CALL NXTENT/IDET, NEGL, NCCL, NCTA, ALLSTA) C CHECK FIR LAST COL IN ROU FENCOL LT ONG TO 1300 C ROU NOT COMPLETE, COMPUTE INTERE FOR ROINT CALL RANGE: ICRT, NEGL, NCCL, ISTRI, NCME, ALL STA, ISMNET, ISHYET, I IMPET, NYRT, NEGE, NHAY) C CHECK FOR ROINT COINCIDENT HITH STATION C THECK FOR ROINT COINCIDENT HITH STATION C THE STRING OF TO 1400
COLL NATENTI (DET. NEGUL NEGUL NEGUL NEGAL ALLETA) CHECK FOR LAST COL IN ROU CHECK FOR LAST COL IN ROU CHECK FOR LAST COL IN ROU CHECK FOR LAST COLOR IN LAGO CHECK FOR LAST COMPUTE INTERE FOR ROUNT CHECK FOR FOLIN COLUMN NEGUL N
CONTRACT COLINGER AND ADDRESS
CHECK FOR POINT COINCIDENT WITH STATION CHECK FOR LAST COL IN ROW IF (NCOL LT ONGO TO 1300 CHECK FOR POINT COMMUTE INTERE FOR ROINT CALL PANGE: LORT, NROW, NCOL, 13TRI, HOME, ALL STA, 12MNRT, 12MYRT, I THARPT, MYRT, NROW, NAY) CHECK FOR POINT COINCIDENT WITH STATION CHECK FOR POINT COINCIDENT WITH STATION CHECK FOR POINT COINCIDENT WITH STATION CHECK FOR NO STATION IN RANGE
GHECK FOR LAST COL IN ROW GHECK FOR LAST COL IN ROW GENERAL LIBRARY INTERP FOR ROLL CALL RANGE: IOPT. NEGH. NCCL. LISTET. HONE, ALL STA. LEMNET. LEMYEY. I HAPT. HAYET. NERF. NHAY) CHECK FOR ROLL COLUMNICATION GHECK FOR ROLL COLUMNICATION LECTORY GOLD GOLD GOLD COLUMN COL. CHECK FOR ROLL COLUMNICATION CHECK FOR ROLL COLUMN COL. STATION CHECK FOR ROLL COLUMN COL. STATION CHECK FOR ROLL COLUMN COL. STATION CHECK FOR NG STATION IN SAME IMMOST INVESTMENT NERF. ALL STA. LEMMET. LEMYET.
G CHECK FOR LAST COL IN ROW IF (NCOL LT .0) GO TO 1300 CALL RANGE (IGPT. NEON. NCOL .1STET. NGNE. ALL STA. ISMNET. ISMYET. I MANDEL IMPERIANCE HAS ALL STA. ISMNET. ISMYET. CHECK FOR SOLMT COLUCIDENT HITM STATION CHECK FOR NO STATION. INTER CHECK FOR NO STATION IN SANGE IS (NOME GT. 0) GO TO 1 300 CALL MEIGHT/10PT.NEON.NCOL.RMER.ALL STA. ISMNET. ISMYET.
GHECK FOR LAST COL IN ROW GHECK FOR LAST COL IN ROW GENERAL LIBRARY INTERP FOR ROLL CALL RANGE: IOPT. NEGH. NCCL. LISTET. HONE, ALL STA. LEMNET. LEMYEY. I HAPT. HAYET. NERF. NHAY) CHECK FOR ROLL COLUMNICATION GHECK FOR ROLL COLUMNICATION LECTORY GOLD GOLD GOLD COLUMN COL. CHECK FOR ROLL COLUMNICATION CHECK FOR ROLL COLUMN COL. STATION CHECK FOR ROLL COLUMN COL. STATION CHECK FOR ROLL COLUMN COL. STATION CHECK FOR NG STATION IN SAME IMMOST INVESTMENT NERF. ALL STA. LEMMET. LEMYET.
GHECK FOR LAST COL IN ROW GHECK FOR LAST COL IN ROW GENERAL TO ANGE TO 1800 GROW NOT COMPLETE, COMMUTE INTERE FOR ROINT CALL RANGE (ICPT, NECH, NCC), ISTRI, MONE, ALL STA, IRMNET, IRMYPT, I THNPT, IMYRT, NERF, NMAY) CHECK FOR ROINT COINCIDENT WITH STATION CHECK FOR NO STATION IN RANGE CHECK FOR ROINT COINCIDENT WITH STATION CALL MEIGHT (COPT, NEGH, NCC), RNFR, ALL STA, IRMNET, IRMYPT, CHECK FOR LAST COINCIDENT WITH STATION CHECK FOR LAST COIN
GRECK FOR LAST COL IN ROW GROW NOT COMPLETE. COMPLETE INTERE FOR ROUNT CALL RANGE: IOPT, NEOH, NCOL , ISTRI, NONE, ALL STA, IRMNET, IRMYET, I THNPT, IMYET, NERS, NHAY) GRECK FOR ROUNT CONNEIDENT WITH STATION CHECK FOR ROUNT CONNEIDENT WITH STATION CHECK FOR NO STATION, INTERE GRECK FOR NO STATION IN RANGE CALL METIGNICIPET, NEOH, NCOL , RNER, ALL STA, IRMNET, IRMYET, INNER, IMYET, NEOR, NHAY, ISTAFI CATA(NCOL) SENER
CHECK FOR LAST COL IN SOU CHECK FOR COMPLETE. COMPUTE INTERP FOR SOINT CHECK FOR SOUNT COUNCIDENT WITH STATION CHECK FOR MO STATION IN SAME CHECK FOR MO STATION CHECK FOR MO STATION CHECK FOR MO STATION CHECK FOR LAST COUNCIDENT WAY ISTAFI CHECK FOR MOST COUNCIDENT WAY ISTAFI CHECK FOR LAST COUNCI
CHECK FIR LAST COL IN ROW CHECK FIR LAST COL IN ROW FINDER LT. ONGO TO 1800 CRU NOT COMPLETE, COMPUTE INTERE FOR ROINT CALL RANGE (LOST, NEON, NCOL INSTRICTION AND STALLEMNST, ISHNET, ISHNET, ISHNET, INTERE FOR ROINT CHECK FOR ROINT COINCIDENT WITH STATION CHECK FOR NO STATION, INTERE CHECK FOR NO STATION IN RANGE CHECK FOR NO STATION IN RANGE, NHAY, ISTAELISHNET, ISHNET, ISH
GUECK FIR LAST COL IN ROW C SHECK FIR LAST COL IN ROW C SQU NOT COMPLETE. COMPRISE INTERE FOR ROINT CALL RANGE (IGET. MEGN. MCGN. 1STEEL MGME. ALL STAL IRMNET, ISHYET. I THAPT, IMMET. MERE, MMAX) C SHECK FOR ROINT COUNCIDENT WITH STATION C HOT OM A STATION. INTERE C SHECK FOR MG STATION IN RANGE C HOURS FOR MG STATION C HOLD SEARCH STATION C ROINT ON A STATION
CHECK FOR LAST COL IN ROW CHECK FOR LAST COLORITE INTERE FOR ROINT CALL RANGE LIGHT, MENULUCOL LISTER, MONE, ALL STAL LEMBET, LEMBET, LEMBET, I THINDT, LIMYET, MERE, NHAY) CHECK FOR ROINT COLNCIDENT WITH STATION CHECK FOR LAST COLNCIDENT WITH STATION CHECK FOR ROINT COLNERS WAS AND STATION CHECK FOR ROINT COLNCIDENT WITH STATION CHECK FOR ROINT WITH STATION WITH STATION CHECK FOR ROINT WITH STATION WITH STATION CHECK FOR ROINT WITH ST
CHECK FOR LAST COL IN ROW CHECK FOR LAST COLORESTE INTERE FOR ROUNT CHECK FOR ROUNT COUNCIDENT WITH STATION CHECK FOR MO STATION IN RANGE CHECK FOR MO STATION CHECK FOR LOW STATION CHECK FOR LAST COLOR TO 1300 CHECK FOR LAST COLOR
GHECK FOR LAST COL IN ROW CHECK FOR LAST COL IN ROW CHECK FOR LAST COL IN ROW CHECK FOR LAST COLLING INTERP FOR ROBER CHECK FOR SOLMT COMBUTT INTERP FOR ROBER CHECK FOR SOLMT COMMUNICAL ISTAT. HOME. ALLISTA. ISMNET. ISMNET. INNET. HYPT. HYPT. HORS. NHAY) CHECK FOR SOLMT COMMUNICAL ISTATION CHECK FOR SOLMT COMMUNICAL ISTATION CHECK FOR SOLMT COMMUNICAL ISTATION CHECK FOR MO STATION. IN RANGE CHECK FOR MO STATION. IN RANGE CHECK FOR MO STATION CHECK FOR SOLMT COMMUNICAL RANGE, ALLISTA, IPHNET,
CHECK FOR LAST COL IN ROW CHECK FOR LAST COLORITE INTERE FOR ROINT CALL RANGE LIGHT, MENULUCOL LISTER, MONE, ALL STAL LEMBET, LEMBET, LEMBET, I THINDT, LIMYET, MERE, NHAY) CHECK FOR ROINT COLNCIDENT WITH STATION CHECK FOR LAST COLNCIDENT WITH STATION CHECK FOR ROINT COLNERS WAS AND STATION CHECK FOR ROINT COLNCIDENT WITH STATION CHECK FOR ROINT WITH STATION WITH STATION CHECK FOR ROINT WITH STATION WITH STATION CHECK FOR ROINT WITH ST
SCHECK FOR LAST COL IN ROW CHECK FOR LAST COL IN ROW CHECK FOR LAST COL IN ROW CHECK FOR LAST COLING TO 1900 CHECK FOR LAST LAST LAST LAST LAST LAST LAST LAST
GUECK FOR LAST COL IN ROW GUECK FOR LAST COL IN ROW GUECK FOR LAST COL IN ROW GUECK FOR LAST COMBUTE INTERE FOR ROUNT CALL RANGELIGET. COMBUTE INTERE FOR ROUNT CALL RANGELIGET. MEDIA LISTET. MONE, ALL STA. IRBNET. IRBNET. GUECK FOR ROUNT COUNCIDENT WITH STATION CHECK FOR NO STATION IN PANCE GUECK FOR NO STATION IN PANCE GUECK FOR NO STATION IN PANCE GUECK FOR NO STATION IN PANCE CHECK FOR NO STATION IN PANCE GUECK FOR NO STATION IN PANCE CHECK FOR NO STATION IN PANCE CHECK FOR NO STATION CHECK FOR NO STATION CHECK FOR NO STATION CHECK FOR LOST COUNCIDENT WITH STATION CHECK FOR NO STATION CHECK FOR LOST COUNCIDENT WITH STATION CHECK FOR NO STATION CHECK FOR LAST COUNCIDENT WITH STATION CHECK FOR STATION CHECK FOR LOST COUNCIDENT WITH STATION CHECK FOR STATION WITH STATION CHECK FOR LOST COUNCIDENT WITH STATI
GUECK FOR LAST COL IN ROW CALL RANGE CORLETT COMBUTE INTERS FOR ROUNT CALL RANGE CORLETT COMBUTE INTERS FOR ROUNT GUECK FOR ROUNT COUNCIDENT WITH STATION GUECK FOR ROUNT WITH MARKET WHAY ISTATION GUECK FOR ROUNT WITH MARKET WHAY ISTATION GUECK FOR STATION GUECK FOR
##################################
##################################
##################################

· All fact
1 RETURN
· END
:
)
SUBSCUTINE NYTENT (IDET NECUL NGTA ALLETA)
C*************************************
C THIS ROUTINE RETURNS THE NEXT COLUMN OR THE NEXT
C STATION TO BE INTERPOLATED FOR (STATION WHEN TOPT
C IS 1 OR 2, AND COLUMN WHEN TOPT IS 3 OR 4).
C*************************************
INTEGER ALISTA(200.5)
INTEGER IELIM(41,2)
DATA IFI IH/74.73.73.72.72.71.69.68.64.63.62.54.53.52.51.50.
50,49,48,47,46,45,45,20,17,15,13,11,10,9,8,6,3,1,1,1
lelelelele
t 74.76.78.86.88.88.90.92.93.93.93.92.91.94.96.98.100.
102,117,117,117,117,117,117,117,117,117,11
117,117,117,117,117,117,117,117,117,117
DATA TOUTDY // / JACTOT / / /
DATA ICNTPT/1/+LASTPT/-1/
C. CUSTON CONTROL
C CHECK OPTION
IE(IOPT.GT.2)GQ TQ 1000
C STATION ONLY
STATION ONLY
100 IF(ALLSTA(ICNTPT+1)-LT-0)50 TO 500
IF(ALLSTACICNTPT.4).FG.03GG TO 200
C NOT A CONTROL STATION, GET NEXT ONE
ICUTET A ICUTET A 1
50 TO 100
C
C CONTROL STATION
C
200 NSTAWALL STACTION TPT.1)
MCDL=ALLSTA/ICNTPT.33
MRCHEAL STACTONIPT. 2)
ICNTPT=ICNTPT+1
II C
C ALL STATION SENT.FLAG
1 700 1071-1
· EOO NSTA=-1
7 CONTROL
* RETURN
' C ENTIRE EIFLD
1 0
1 1000 JEUASTRI J. 0300 JG 1500
C NOT AT SECTIMING. SOMEWHERE IN MIDDLE OF ROM
LASTPT=LASTPT+1
IF(ASTRI OT IF IM(NEGH=34.2)) GO TO 1200
C NOT PAST END SEND RACK COL NUMBER
NCOL ALASTRY
RETURN
C ROW COMPLETE, FLAG
1309 NGOL 1
LASTRICAL
RETURN
C START AT REGINNING OF ROW
_ C
LSOO LASTRY-IELIM(NROH-34-L)
NCOL-LASIPT
FETURN
END
14
11
10

•
:
· · · · · · · · · · · · · · · · · · ·
SUBSCUTINE RANGE (TOPT NECH , NCCOL , TSTPT , NCNE , AL STA , ISHNET , TSHYPT ,
[HHRT.:YXRT.NRSE.NHAY)
CANADA CA
C. THIS POLITIME SETS THE POINTERS FOR INTERPOLATION CHER THE STATION
C ARRAY AND COUNTS THE NUMBER OF STATIONS THEN UPNCTING POINT FLAGS
C IF NO STATION IN RANGE, FLAGS IF POINT COUNCIDENT WITH STATION.
C231118111111111111111111111111111111111
INTEGER ALL STA (200.5)
DATA NPRETH/A/. IFREDL/5/. IMAXDI /10/. TANA/1/
MONE = 0
ISTPT=0
C SET STATION OPTION
NORTH-I
IF (TOPT.LT.J)NOPT=0
C SET UP HING AND HAYS
TOPMAY-NOOL - TPSETU
ICPMAX=NCOL + IPREDL
TSPHAY=NROU+IPREDI
TCHINENCOL - IMAXOL
TOWAY - INAVII
ISHIN=NROW-IHAXDI
I PHAX MICOUL I HAXDI
C SET UP POINTERS FOR COLUMN, MIN POINT FIRST
100 IF(ALLSTA(IMMPT,1).GT.(IMM)GG TG.150
C NO. CHECK FOR EQUAL
TE(ALL STACEMENT, 3) FR. COMINIGO TO 700
C NO. HOUS DOWN
C CHECK FOR HORE STATIONS
110 IF(ALLSTACINAPTALLE) A T. 0.000 TO 120
C INCREMENT DOWN
THIRTEIMIPTE
IF (ALL STAY IMPER, 3) GE, ICHINAGO, TO 200
C LAST STATION SEACHED, STOP HERE
120 THYRTainhipt
I IPHNET SIMPT I IPHYET SIMPT I IPHYET SIMPT I IPHYET SIMPT I IPHYET SIMPT OVER AT TOP
TPMYPT=[MHPT
9 77 1000
C TOO FAR DOWN, START OVER AT TOR
TMNETAL
1 C 30 TD 100
1 C SET DEFERRED MIN
The second secon
205 IF(ALLSTA(IPHNPT.J).GE.ICPHIN)GO TO 300
G NO. CHECK FOR NEXT STATION
C NO HORE STATIONS, INCREMENT
TEMMETATEMENTAL
30 TO 205
C NO HODE STATIONS STEP HERE
O HO HORE STATIONS. STOP HERE
G HO HORE GTATIONS GTCP HERE 210 INVETAIRHNET ISHVETAIRHNET
210 INXET-IRHURT
210 INXETAIRHNET
210 INXETAIRHNET
210 IMXET-IRHNET IRMXET-IRHNET GO TO 1000
210 IMXET-IRHNET IRMXET-IRHNET GO TO 1000
210 IMXET-IRHMET IRMXET-IRHMET GO TO 1000 C C SET PSETERSED HAY
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APPENDIX B

OFFICIAL SYNOPSES BY NWS FORECAST OFFICE, WASHINGTON, D. C.

Official Synopses by NWS Forecast Office, Washington, D. C.

August 15-16, 1980: A cold front extension from Central New York to Indiana on the morning of August 15 moved southeastward across Virginia in the night and became stationary over the Carolinas on the 16th.

September 9-10, 1980: A strong cold front located in the Ohio Valley the morning of September 9 moved across the Appalachians by night reaching the north portion of Chesapeake Bay late at night. It moved east of the Bay and east coast early Wednesday (Sep. 10) morning, but trailed back across western North Carolina at 0939Z September 10.

September 16-17, 1980: No front in the area. Southeasterly winds of 10 to 15 knots in the afternoon becoming southerly 10 to 15 knots in the night.

September 17-18, 1980: A cold front moved eastward through the Ohio Valley on September 17 and stalled over the Appalachians late in the day, spreading showers and thunderstorms over Virginia. A warm front formed across southern Virignia during the afternoon, but weakened in the night. The cold front extended from eastern New England through southwest Virginia by 0939Z September 18. It moved southeastward off the coast by late in the day.

September 24-25, 1980: A stationary front extended east-west across the Carolinas near 35° north. Some rain developed across Virginia due to the nearness of the front.

September 25-26, 1980: A cold front extending from Ohio into Tennessee on the 25th moved rapidly eastward crossing Chesapeake Bay late on the night of September 25. A strong secondary cold front crossed the Appalachians on the morning of September 26 and moved offshore early in the afternoon.

October 1-2, 1980: A low center east of the Virginia capes moved slowly east northeastward on October 1 and early October 2. A cold front in the midwest moved eastward across the Appalachians late on October 2.

October 24-25, 1980: A deepening low off the Georgia coast on the morning of October 24 moved northward, reaching the North Carolina coast south of Hatteras at 3 a.m. (EDT) October 25. It continued to intensify as it moved northward into the southern Chesapeake Bay.

November 14-15, 1980: A slow-moving cold front crossed the Appalachians on the afternoon of November 14 and into central Virginia at night.

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November 15-16, 1980: The cold front moved across the Chesapeake Bay and southern Virginia the morning of November 15 and became stationary over the Carolinas by night. Late on the night of November 15 a low moved eastward off the North Carolina coast. High pressure dominated Virginia on the morning of November 16.

November 17-18, 1980: A frontal trough developed late the morning of November 17 near the Virginia capes and Carolina coastline, intensifying in the afternoon. A low pressure center formed offshore along the front near southeastern Virginia during the night and moved east northeastward at 30 knots, with a cold front trailing down across South Carolina by late on November 18.

December 9-10, 1980: A low over Kentucky on the morning of December 9 moved northeastward across West Virginia in the afternoon, across Pennsylvania in the night and off the New England coast on December 10. A cold front southward from the low crossed Virginia in the afternoon and night of the 9th.

By 1200Z December 10 the front was in southeastern Virginia moving offshore.

March 4-5, 1981: An intensifying low over the plains states was moving eastward, but could not affect Virginia weather. Another intensifying low developed over South Carolina in the early morning of March 5 and began moving northeastward.

March 5-6, 1981: The intensifying low over South Carolina at 0939Z March 5 moved to northeastern North Carolina by 1539Z and off the Virginia capes by 2139Z and moved off to the east northeast thereafter. Virginia was dominated by strong northerly winds, with snow flurries.

March 16-17, 1981: A strong cold front moved southeastward across Virginia on March 16, and out over the Atlantic late in the day.

March 22-23, 1981: A weak high pressure ridge remained over Virginia on March 22, moving off the coast early in the morning of March 23. A developing low over Arkansas early on March 22 moved rapidly eastward and off the South Carolina coast by late in the morning of March 23.

March 29-30, 1981: A strong high off the Carolina coast moved slowly eastward. A cold front over the great plains moved rapidly eastward but was still west of the Appalachians early on the morning of March 30.

March 30-31, 1981: The cold front extending southward from Chicago on the morning of March 30 moved eastward across Virginia late in the afternoon and off the east coast at night. High pressure built up behind the front.

April 14-15, 1981: A warm front lying across southwest Virginia in the morning moved eastward across the state in the afternoon. A strong cold front followed in the wake of the warm front, moving east and south of Virginia shortly before midnight.

May 15-16, 1981: A cold front from Ohio to Georgia in the morning moved to a line from eastern Ohio to central South Carolina by evening. It crossed Virginia during the night reaching the coast shortly after daybreak.

May 18-19, 1981: High pressure dominated Virginia today, but a low moved into western Tennessee in the late afternoon with a warm front extending eastward from the low across the Carolinas. The front lay east-west across southern Virginia during the night, and became stationary across northern North Carolina in the early morning.

May 19-20, 1981: An east-west front across central North Carolina remained stationary today as a 1007-mb low in western Tennessee at 1200Z moved eastward along the front, reaching the North Carolina coast Wednesday morning. Early Wednesday morning (May 20) the front became a cold front and moved southward across South Carolina.

APPENDIX C STATIONS USED IN INVESTIGATION

APPENDIX C - STATIONS USED IN INVESTIGATION

Name .	<u>Call</u>	ID	Row	<u>Co1</u>	Lat	Long	Status
Allisonia	AL	1	66	40	36.90	80.75	Control
Altavista	AV	2	63	60	37.10	79.30	Analysis
Amelia (see JE)	AE	153	61	78	37.30	78.03	Analysis
Amissville	AM	3	45	79	38.68	78.02	Control
Appomattox	AP	4	60	66	37.37	78.88	Analysis
Bedford	BD	5	60	57	37.35	79.52	Control
Berryville	BE	6	40	79	39.15	77.98	Control
Big Meadows	BM	7	47	73	38.52	78.43	Analysis
Blacksburg	BL	8	62	44	37.18	80.42	Analysis
Bland	BN	9	63	35	37.10	81.10	Control
Bremo Bluff	BB	10	56	74	37.70	78.30	Analysis
Bridgewater	BW	140	49	65	38.38	78.97	Analysis N
Brooknea1	BR	11	64	65	37.03	78.98	Control
Buchanan	BU	12	58	55	37.53	79.68	Analysis
Buckingham	BK	13	58	71	37.55	78.55	Control
Buena Vista	BV	14	56	60	37.73	79.35	Control
3yllesby	BY	15	67	36	36.80	80.98	Control
Camp Pickett	CP	16	64	79	37.03	77.95	Control
Charlotte C. H.	CC	17	64	69	37.07	78.65	Control
Charlottesville	CT	18	53	71	38.03	78.52	Control
Charltsvl Airpt	CHO	117	52	72	38.13	78.45	Analysis
Chase City	CY	141	66	72	36.83	78.47	Control N
Chatham	CM	19	67	59	36.82	79.40	Control
Clarksville	CL	20	69	71	36.62	78.57	Control
Clifton Forge	CF	21	55	53	37.82	79.83	Analysis *
Columbia	CU	22	56	77	37.77	78.15	Analysis
Concord	CO	23	61	65	37.28	78.97	Control
Copper Hill	CH	24	63	48	37 .10	80.13	Control
Corbin	CN	25	51	′ 88	38.20	77.37	Control
Covington	CV	26	55	50	37.80	80.00	Control
Craigsville	CR	27	52	59	38.08	79.38	Control
Crozier	CZ .	28	57	82	37.63	77.80	Analysis
Cumber and	CB	154	59	75	37.50	78.25	Control
Danville Arpt.	DAN	36	69	59	36.57	79.33	Analysis

Name	Call	ID	Row	Co1	Lat	Long	Status
Danville(Bridge)	DA	29	69	59	36.58	79.38	Analysis
D.C. Nat'l Airpt.	DCA	95	43	93	38.85	77.03	Analysis
Deerfield	DE	30	51	59	38.17	79.37	Control *
Dulles Int. Arpt.	IAD	94	42	87	38.95	77.45	Analysis
Earlehurst	EA ·	31	57	47	37.67	80.23	Analysis
Edinburg	ED	166	43	70	38.85	78.60	Control N
Emporia	EM	32	68	85	36.68	77.55	Control
Farmville	FA	33	61	73	37.33	78.38	Analysis
Floyd	FY	34	65	46	36.93	80.30	Control
Fort Belvoir	DAA	114	45	90	38.72	77.18	Control
Fort Eustis	FAF	118	63	98	37.13	76.62	Control
Free Union	FU	35	51	71	38.15	78.57	Analysis
Gathright Dam	GT	155	54	51	37.95	79.95	Analys is
Glasgow	GG	37	57	58	37.62	79.43	Control
Glen Lyn	GL	38	60	38	37.37	80.87	Control #
Gordonsville	GD	39	52	76	38.08	78.18	Analysis
Goshen	GO	40 .	53	57	37-98	79.50	Analysis
Grundy	GR	41	61	21	37.27	82.08	Control
Hillsville	HI	42	68	40	36.67	80.73	Analysis
Holcombs Rock	HR	43	59	61	37.50	79.27	Control
Holland	НО	44	68	96	36.68	76.78	Control
Hot Springs	HS	45	53	53	38.00	79.83	Control
Huddleston	HU	46	63	57	37.15	79.50	Control
Independence	IN	47	69	34	36.65	81.17	Analysis
Isle of Wight	IM	142	65	97	36.92	76.70	Analysis N
Jetersville (AE)	JE	169	61	78			N
John Flannagan Lk	FL	48	62	17	37.23	82.35	Analysis
John Kerr Dam	KD	49	69	75	36.60	78.28	Analysis
Kerrs Creek	KC	50	55	56	37.87	79.57	Control
Keysville	KY	156	63	71	37.17	78.52	Analysis
Lafayette	LA	51	62	47	37.23	80.22	Control
Lancaster	LN	167	55	100	37.80	76.52	Analysis N
Langley AFB	LFI	52	64	102	37.08	76.35	Analysis
Leesburg	LE	143	40	85	39.12	77.58	Analysis N
Luray	LU	53	45	73	38.67	78.38	Control
Lynchburg	LYH	54	61	62	37.33	79.20	Analysis

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Name	Call	ID	Row	<u>Co1</u>	Lat	Long	Status
Martinsville Fil	MF.	157	68	52	36,70	79.88	Analysis
McDowell	MC	55	49	57	38.33	79.50	Control
Meadows of Dan	MD	56	68	44	36.67	80.45	Control
Millgap	MI	57	49	54	38.35	79.72	Control
Mill Run Farm	MR	58	51	54		. 79.73	Control
Montebello	MB	60	54	63	37.88	79.13	Analysis
Mountain Grove	MG	61	52	52	38.10	79.88	Analysis
Mt. Solon	MS	158	49	63	38.35	79.08	Analysis
Mount Weather	MW	62	41	80	39.07	77.88	Analysis
NAS, Norfolk	NGU	151	65	103	36.93	76.28	Control
New Castle	NC	63	59	49	37.50	80.10	Control
Newport	NE	64	61	43	37.32	80.52	Control
Newport 6NE	NP	144	60	44	37.35	80.42	Analysis N
Newsoms	NS	145	69	91	36.63	77.12	Analysis N
Norfolk	ORF	65	66	104	36.90	76.20	Analysis
North Fork Lake	NF	66	63	13	37.13	82.63	Control
North River Dam	NR	67	49	61	38.37	79.27	Analysis *
Oceania	NTU	116	66	107	36.83	76.02	Control
Orange (PE)	PE	71	51	77	38.22	78.12	Control
Palmyra	PA	68	55	75	37.87	78.25	Control
Patrick Henry	PHF	152	63	100	37.13	76.50	Analysis
Pedlar Dam	PD	69	57	60	37.67	79.28	Analysis
Petersburg	PG	159	62	87	37.23	77.40	Control
Philpott Dam	PT	70	67	50	36.78	80.03	Control
Piedmont R.S. (OR)	PE	71	51	. 77	38.22	78.12	Control
Pilot	PI	72	64	45	37.07	80.35	Analysis
Piney River	PR	73	56	65	37.70	79.00	Control
Powhatan	PW	160	58	80	37.53	77.92	Control
Quantico Marine	NYG	113	47	89	38.50	77.30	Analysis
Radford	RA	74	63	42	37.13	80.55	Control
Randolph	RL	75	65	69	36.98	78.70	Analysis
Rapidan	RP	76	50	78	38.30	78.07	Analysis
Richmond	RIC	77	59	88	37.50	77.33	Analysis
Riverton	RI	78	42	76	38.93	78.20	Control *
Roanoke	ROA	79	61	51	37.32	79.97	Analysis
Rockfish	RO	80	55	68	37.80	78.75	Analysis

Name	Call	ID	Row	Co1	Lat	' 'Long	Status	
Rocky Mount (Va)	RM	81	65	52	37.00	79.90	Analysis	
South, Boston	SB	161	68	66	36.70	78.88	Analysis	
Speedwell	SP	82	67	34	36.82	81.17	Control	
Staffordsville	SF	83	61	40	37.27	80.72	Analysis	
Stanardsville	sy	147	50	72	38,27	78.45	Control N	
Staunton S.P.	ST	84	51	64	38.15	79.03	Control	
Sterling	SG	85	42	86	38.98	77.47	Control	
Stony Creek	SC	86	66	87	36.90	77.45	Analysis	
Stuart	SU	162	69	46	36.63	80.27	Control	
The Plains	TP	87	43	82	38.90	77.75	Control	
Timberville 5E	TI	148	46	69	38.62	78.68	Control N	
Trout Dale	TD	88	68	30	36.67	81.40	Analysis	
Tye River	TR	89	57	65	37.63	78.93	Analysis	
Wakefield 6NE	WF	149	64	94	37.02	76.90	Analysis N	
Wallaceton	WL	90	69	101	36.60	76.43	Analysis	
Wallops Island	WAL	91	54	115	37.95	75.48	Analysis	
Warrenton	WR	92	45	82,	38.68	77.77	Analysis	
Washington, Va.	WG	93	45	76	38.72	78.17	Analysis	
Waverly	WV	115	64	92	37.03	77.10	Control	
West Point	₩P	150	59	95	37.52	76.83	Control N	
Willis	WS	163	66	43	36,85	80.48	Analysis	
Winchester	WI	96	39	76	39.20	78.17	Control'	
Winterpock	WK	164	61	84	37.33	77.65	Analysis	
Woodstock	WD	97	43	71	38.88	78.52	Analysis	
Woolwine	WO	98	68	46	36.72	80.28	Analysis	
Wytheville	WY	99	65	35	36.93	81.08	Analysis	
		01	ut of Sta	te				
Andrews AFB, Md.	ADW	103	44	95	38.80	76.87	Analysis	
Baltimore, Md.	BAL	100	40	98	39.18	76.67	Analysis	
Beckley, W.Va.	BKW	119	56	34	37.78	81.12	Analysis	
Bluefield, W.V.	BLF	106	61	33	37.30	81.22	Analysis	
Bristol, Tenn.	TRI	107	70	16	36.48	82.40	Analysis	
Charleston, W.V.	CRW	120	49	27	38.37	81.60	Analysis	
Dover, Del.	DOV	137	40	115	39.12	75.45	Analysis	
Elizabeth C., N.C.	ECG	108	73	105	36.27	76.18	Analysis	
Elkins, W. Va.	EKN	105	43	52	38.88	79.85	Analysis	
			C-5					

Name	Call	ID.	Row	Co1	Lat	Long	Status
Greensboro, NC	GSO	110	75	51	36,08	79.95	Analysis
Huntington, WV	HTS	122	49	14	38,37	82.55	Analysis
Matinsburg, WV	MRB	104	37	79	39.40	77.98	Analysis
Patuxent, Md.	NHK	101	49	101	38.33	76.42	Analysis
Raleigh, N.C.	RDU	109	77	68	35.87	78.78	Analysis
Rocky Mount, NC	RWI	112	78	80	35.85	77.88	Analysis
Salisbury, Md.	SBY	102	49	114	38.33	75.52	Analysis
Winston-Salem NC	INT	111	74	47	36.13	80.23	Analysis

N - NATS Station

Due to closing of stations and resulting imbalance, the status of eight stations was changed midway through the study. Columbia, Goshen, Independence and Patrick Henry were changed from Control to Analysis; Corbin, Craigsville, Millgap and Winchester were changed from Analysis to Control.

^{* -} Station closed during later part of this study.

^{# -} Glen Lyn now takes observations at 6 p.m.

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